



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



Boy's own book

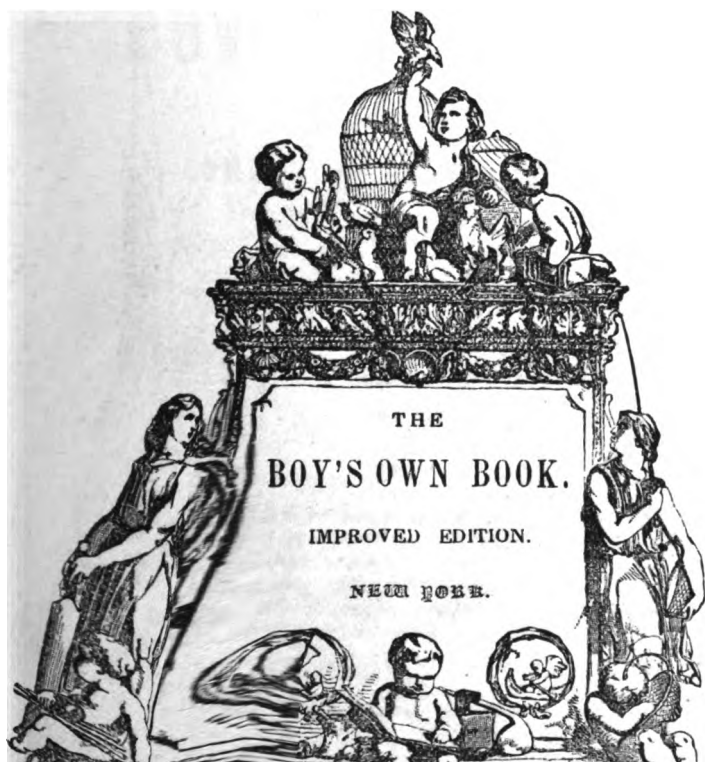
KD 12249

**Gift of The People of the United States
Through the Victory Book Campaign
(A. L. A. — A. R. C. — U. S. O.)
To the Armed Forces and Merchant Marines**

This book belongs
to Frank Scribner—

W. B. Scribner
Book





KD12249



••••• PRELUDE. •••••

A POPULAR ENCYCLOPEDIA of the Sports and Pastimes of Youth, companion for all holydays,—THE BOY'S OWN BOOK,—unnixed with ought that was not highly interesting to himself, had long been a desideratum; to supply which, he was usually led to become his own caterer and purchase publications of an objectionable character, merely because their low price placed them within his reach. The present Work was an attempt to obviate this inconvenience, by enabling those, who had the guardianship of youth, to present their young protégés, in the form of Holyday or Birthday Present, with a concentration of all that usually delights them, executed in such a manner as their own judgment would



PRELUDE

A wider field than we have taken cannot well be imagined. Our plan embraces the amusements of all minds, and of all seasons,—in winter and in summer,—at home and abroad; the robust and the delicate,—the contemplative and the ingenious,—have each their tastes provided for. The sports and exercises of out-door enjoyment,—the pastimes of a winter's fire-side,—and the recreation of science,—are copiously detailed in our pages, which have been printed in a close type, that we might be enabled to compress a whole library of sportful lore in the brief compass of one little volume. We can honestly say, that no pains have been spared to do justice to our plan. We have attempted to please Seniors and Juniors,—no easy task; but our failure can only be partial, for should we be condemned by a few, we are sure that the many will be in our favor; and that a host of advocates, appreciating our industry and our motives, would cheerfully undertake, on our behalf, the task of a reader.

So far the London Preface. The American publishers have omitted a few articles, entirely useless on this side the Atlantic, as the extra expense would have debarred the more useful part from being in the hands of hundreds of Youths, who will find everything that will amuse them in our present volume.







MISCELLANEOUS OUT-DOOR SPORTS.

We heartily trust that our young readers will commence the perusal of our pages with pleasure equal to that which we feel in sitting down to write them, and that we shall go pleasantly together through our work. Thus



after, and found warmth and high spirits in a game of "Prisoner's Base,"—or made the brows glow at lofty "Leap-frog,"—or defied the frost by briskly plying the whip-top with eel-skin, and came in with glad hearts, ruddy cheeks, perfect willingness, and the best of appetites, to our morning repeat and subsequent studies. It will bring to our recollection also, those smooth and sunny spots, where, when the noontide sun was midway in the heavens, in the sultry month of August, we alternately perused pleasant and instructive books, and played with our class-mates at "Increase-powder," or set up a pyramid of marbles for them to shoot at, or shot at one erected by one of them. It will carry us back in imagination to the hills and downs, where we flew our kites,—the loftiest soarers for miles around;—of mishaps; through breaking of strings, and long races of rivalry after our falling favorites;—to that cheerful parlour, in which, during the winter vacation, when mince-pies, plum-puddings, and young parties, were most abundant,—on Christmas-eve, or mirthful Twelfth-night, most especially,—we bore a part in the exhilarating and harmless fireside sports of the season;—to that dilapidated ruin,—the court of that mouldering castle, with a tall and stately elm rising from one of its corners, and ivy, apparently ages old, the constant home and nestling-place of innumerable birds, which berlecked and supported the outward side of its walls,—the scene of our chief exploits at Fives;—to the garden walk, where our school-swing was erected, between two gigantic sister pear-trees;—and, in brief, to all those places where we played the games which were the delight of our holidays; when a sportive bout at "Saddle my Nag," was in itself an ample recompense for the past two hours of study, employed in working an intricate question in arithmetic—composing a theme on some difficult subject—rendering a portion of the *Iliad* into Latin hexameters, or a passage of Pope into French prose. We conceive that we are bringing no disgrace on our boyhood, by avowing that we deeply enjoyed the sports of the play-ground. The line of a talented writer, "A dunce at Syntax, but a dab at taw," has, by a thoughtless few, been converted into a proverb, and those who were most eminent for their activity and love of the usual amusements of youth out of school, have thus been unjustly stigmatized as inattentive students. The reverse, we have generally found to be the fact; for, we have often remarked, that the lads who led the sports in the play-ground, stood high in their classes in the school-room. "There is a time for all things," is a trite, *out*, in this case, an applicable observation: the scholastic discipline wisely allots certain hours in the day for recreation; they should be employed in healthful and agreeable pastime, so as to render the boy prepared to return with mental vigour to his books;—study should give a relish to sport, and sport to study. But while we recommend that the school-room should be forgotten on the play-ground, we wish to impress on our young readers the necessity of their forgetting the play-ground in the school-room.



MINOR SPORTS.

9



GAMES WITH MARBLES.

THERE were, some years ago, and we believe, there still are, three or four different sorts of marbles : the Dutch, or variegated clay marbles, were reckoned the worst ; those of yellow stone, with beautiful spots or circles of black or brown, were next in estimation ; and what were called the real taws, of pink marble, with dark red veins, " blood allies," were preferred to all others. The games with marbles are not very numerous ; the following pages contain descriptions of all that have come to our knowledge.

SPANS AND SNOPS.

This is the most simple of all games with marbles ; one player first shoots his marble, the second then endeavours to strike or *snop* it, or otherwise, to shoot his own within a span of it. If he miss, or do not fire within the span, the first player, from the spot where his marble rests, in like manner, shoots at that of the second ; and so on, until a snop or span is made, when the marble snopped or spanned is taken, and the game begun anew, by the winner.

BOST-ABOUT.

This game differs from the preceding one only in this respect, namely that the marbles, instead of being shot with the fore-finger and thumb, are pitched, or to use the technical word, *bosted*, by the players.



HOLES.

Three small holes are dug, about a yard and a half asunder; a line is drawn about two yards from the first hole, from which the players begin the game. Chance decides who shall have the first shoot; the object is to drive the marble into the first hole; if this be done, the player shoots again, at the distance of a span, towards the second. If, however, he miss the hole, the other player begins, and each shoots, alternately, as the other misses. After having shot the marble into a hole, the player is allowed, if his adversary's marble be near, to drive it with his own as far as he can, and if he strike it, to shoot again. The game is won by the player who gets first into the last hole, in the following order:—first hole, second, third, —second, first,—second, third. The loser places his knuckles at the first hole, the winner shoots as near to it as he can from the line, and fires three times, from the place where his marble rests, at the loser's knuckles.

KNOCK-OUT.

Two or more may play at this game. He who begins, throws a marble gently against a wall, so that it rebounds to a distance not exceeding a yard; a second player throws another marble against the wall, endeavouring to make it rebound, so as to strike or come within a span of the first; if he can do neither, the first player takes up his own marble, and, in turn, strives to snop or span that of the second. The marble that is thus snopped or spanned, is won, and the winner begins again. Where only two play, it is best to knock out two or three marbles each, alternately, before they begin to use those on the ground. In this case, a player may win his own marbles, as they are common stock when down, and take up which he pleases, to play with.

THE CONQUEROR.

This is a sport, which we do not much approve of, although we must confess, that in the days of our youth, we were very fond of it. Strong stone marbles of a moderate size must be used. The game is commenced by one boy laying his taw on a piece of smooth and tolerably hard earth, (turf and pavement are both improper,) the other player throws his taw at it, as hard as he can, so as to split it if possible. If he fail to do so, his own taw is thrown at in turn, and thus each player has, alternately, a cast at the taw of the other. A strong marble will frequently break, or conquer, fifty or a hundred others; where this game is much played, a taw that has become a conqueror of a considerable number, is very much prized, and the owner will not play it against any but those which have conquered a respectable quantity. "When Greek meets Greek," or when two conquerors are engaged, the number of marbles previously broken by



MINOR SPORTS

11

the vanquished is added to those of the victor; thus, if my taw having already split twenty marbles, conquers another that has split twenty, my taw then becomes a conqueror of forty-one,—that is, twenty, its previous score; twenty, the vanquished taw's score, and one for the broken taw itself. In the west of England, the game of "The Conqueror" is also played, with small, hard, variegated shells, which are found in old banks, and from which the snails, their former inhabitants, have disappeared. The shell is held in the forefinger of the right hand, and its beak pushed vigorously against that of the adversary's; the shell which breaks is of course, conquered.

ARCH-BOARD

This game, in some parts of England, is called "Nine-holes;" it has various names, and is sometimes played with iron bullets instead of marbles. The marbles are bowled at a board set upright, resembling a bridge, with nine small arches, all of them numbered; if the marble strike against the sides of the arches, it becomes the property of the boy to whom the board belongs; but, if it go through any one of them, the bowler claims a number equal to the number upon the arch it passed through. We have seen the boards, in this game, marked above some of the arches with noughts, in this order:—5, 0, 1, 2, 0, 3, 0, 4, 0. In some places, where there are no noughts on the board, and the numbers go beyond five, the bowler not only loses his marble, if it strike against the sides of the arches, but also gives the board-keeper a marble each time he bowls.

RING-TAW.

The rules of Ring-taw vary in different places; the following are the most general:—A circle is drawn, into which each party places as many marbles as may be agreed on. A line, called the offing, is then drawn at some distance, from which each in turn shoots at the ring. Shooting a marble out of the ring, entitles the shooter to go on again, and thus the ring may be sometimes cleared by a good player, before his companion or companions have a chance. After the first fire, the players return no more to the offing, but shoot, when their turn comes, from the place where their marbles rested on the last occasion. Every marble struck out of the ring, is won by the striking party; but if the taw at any time remain in the ring, the player is not only out, but if he have, previously, in the course of the game, struck out any marbles, he must put them in the ring again. And if one player strike with his taw of another, the player whose taw is so struck, is out; and if he have, previously, shot any marbles out of the circle, he must hand them over to the party by whose taw his has been so struck.



INCREASE-POUND.

This is superior to any other game with marbles. It differs from "Ring taw" in the following particulars:—If, previously to any marble or shot being struck out of the ring or pound, the taw of one of the players be struck by the taw of another, (except that of his partner,) or in case he shoot his taw within the pound, in either case, he puts a shot in the ring, and before either of the others play, shoots from the offing and continues in the game; but if the first of these events occur after one or more shots have been struck out of the pound, if he have previously, during that game, obtained any shots himself, he hands them over to the party who has struck him, and also puts a shot in as before, previously to his shooting from the offing; but if he have previously obtained no shots during the game, he is put out of the game entirely, or "killed," by his taw being so struck; and again, if after a shot or shots have been struck out of the pound, his taw get within it, (on the line is nothing,) he puts his shots, if he have obtained any, with an additional one, into the pound, and shoots from the offing; but if he have not obtained a shot or shots after his taw so remains within the ring, "or gets fat," as it is called, he is "killed," and stands out for the remainder of the game. When there is only one marble left in the ring, the taw may then remain inside it, without being "fat" at this game. The players seldom put more than one marble each in the ring at first.

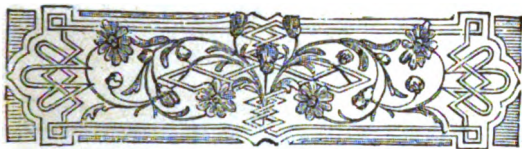
THE PYRAMID.

A small circle is drawn on the ground, within which, one player builds a pyramid, by placing three marbles triangularly, and a fourth in the centre, on the top of them. Any other player may then shoot



at the pyramid, at an agreed distance, by giving, for each time of shooting, to the one who keeps the pyramid, a marble. If the shooter strike the pyramid with his taw, as many of the marbles composing the pyramid, as may be driven out of the circle, belong to the shooter, and the pyramid is constantly to be kept up

complete by its owner. This is a good in-door game; variety and additional interest may be given to it, by each player taking the office of pyramid-keeper, at stated intervals.



GAMES WITH TOPS.

WHIP-TOP.

This is an excellent amusement. The top is easily set up by twirling it with both hands on a smooth surface, and applying the whip with gentleness at first, increasing the vigour of the blows, as the top gets firm on its peg. There is a local variety of the whip-top, which is too singular for us to pass unnoticed. We allude to the Colchester top, of which an engraving is presented in the margin. Its construction is most simple, and, for winning, it is said considerably to excel the tops





PEG-TOP.

In this favorite game considerable dexterity may be acquired by practice. About London, peg-tops are, in general, only used for the purpose of being spun, and taken up to "sleep," as it is called, in wooden spoons, which are sold at the toy-shops for that purpose; but elsewhere, regular games at peg-top are played, in which the victors carry off capital steel pegs as trophies of their prowess at the sport. A circle, whose diameter is about a yard, is first drawn on a smooth piece of ground, (pavement is objectional for this game,) and several players surround it. One volunteers to commence; he throws his top inside the circle, and the others are at liberty to cast theirs at it, so long as it remains within the ring; the moment it rolls out, he may take it up, and peg at those which still remain inside. The object of each player being to split the tops of his companions, if he succeed in any case, he keeps the peg of the split top as the spoil of his victory. If either of the players do not cast his top within the ring, or if he attempt to take it out, or if he fail to set it spinning when he throws, or if it do not spin out, or after it ceases spinning, roll out of the circle, it is called "a dead top," and must be placed in the centre of the ring for the others to peg at. When it is knocked out again without being split, the player to whom it belongs, takes it up, and plays away as before. Sometimes half-a-dozen dead tops are driven out of the ring by one cast, without any of them being damaged, and indeed, if they be made of good box, it is but rarely that they split. A top with a long peg is best at this game, as it is more calculated to swerve out of the ring after it is spun; a top that sleeps after it is cast, runs the greatest danger, and those that sleep most, are heavy bodied tops with short blunt pegs. It is advisable to wind the cord round nearly three parts of the peg, as well as the top, and to use



a button at the end instead of a loop. The Spanish peg-top, of which we give a cut in the margin, is made of fine mahogany, and tapered off less abruptly toward the peg than the English tops. The peg is very short, of an uniform thickness, and rounded, not pointed, at the end. These tops spin nearly upright, and for thrice the usual time; it is unnecessary



TOYS AND GAMES

HUMMING-TOP.

HUMMING-TOPS, of various sizes, are to be bought at the toy-shops; very little art is necessary to use them. After the string is wound about the upright piece, one end of it is taken in one hand, and the handle of the fork-pieces in the other; the string is then to be pulled off with force, and the top is set up.







MINOR SPORTS..

15



GAMES WITH BALLS.

THE games with Balls are numerous and excellent ; Cricket is a sport of such importance, as to claim a separate place in our work, but nearly all the other games with Balls, our young readers will find under the present head.

FIVES.

Fives may be played either single-handed or with partners. A good



MINOR SPORTS.

more than once, strike it below the mark, or drive it out of bounds. If the party who is in do neither of these, he loses his innings; if the other, then the in-player reckons one, on each occasion, towards the game, which is fifteen. When partners play, the rules are precisely the same; each side keeping up the ball alternately, and the partners taking turns for innings, as one of the other side gets out. After the ball is first played out, on each occasion, it is not necessary to make it rebound beyond the ground line, which is used only to make the player who is in, give out the ball fairly in the first instance: that is, when he first takes his innings, or when he plays out the ball again, after winning a point.

NINE-HOLES, OR HAT-BALL.

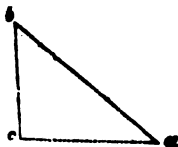
Near a wall where the ground is level, dig nine, or a lesser number of holes, according to the number of players, large enough for a ball to be bowled in without difficulty. Number them, and let each player be allotted a number, by chance or choice, as it may be agreed. A line is drawn about five yards from the holes, at which one of the players places himself, and bowls the ball into one of the holes. The player to whom the hole, into which the ball is bowled, belongs, picks it up as quickly as he can, and endeavours to strike one of the others with it; (the latter all run off as soon as they perceive that the ball is not for themselves;) if the thrower miss his aim, he loses a point, and is called "a fifer," and it is his turn to bowl: if, however, he strike another, he loses nothing; but the party so struck, in case he fail to hit another with the ball, becomes "a fifer," and it is his turn to bowl. Five or six may be struck in succession, and the ball may be kept up, no matter how long, until a miss he made, when the party so missing loses a point, and bowls. It is also allowed, for one player to accept the ball from another, and run the risk of striking a third: thus, if A stand close behind B, and C have the ball in front of B, A may signify by motions that he will take the ball, which is then thrown toward him by C; he catches it, and endeavours to strike B before he can run away; if he miss, he loses a point, and bowls. The second bowling is conducted precisely as the first; but he who bowls three times without passing



MINOR SPORTS

17

the party who has thrown it, a line is drawn from the place where the ball drops, to a spot behind the thrower. Thus, suppose the thrower be at *a*,



the ball falls at *b*, a line is drawn to *c*. The winner then throws the ball, from *c*, at the loser's back, three times, as hard as he pleases. The other losers throw in the same manner, one after another, and the winner has his three balls at each of their backs, from the spot where their balls respectively first touch the ground, or in a line with it, as above stated, and illustrated by the diagram in the margin.

In the vicinity of London, this game is called "Hat-ball," on account of the players using their hats, instead of digging holes, and the ball is tossed into the hats, instead of being bowled into the holes.

CATCH-BALL.

This is very similar to the preceding game. Instead of bowling the ball into holes, it is thrown in the air, and the name of the player, for whom it is intended, called out by the thrower. If it be caught, before it has twice touched the ground, by the player so called on, he loses no point, but throws it up again, and calls upon whom he pleases to catch it. If it be not caught in due time, he whose name is called must endeavour to strike one of the others with it; if he miss, he loses a point, and has his throw up. The remainder of the game, the number of points, and the losers' punishment, are all precisely as in Nine-holes; of the two, it is the better game.

FOOT-BALL.

A match is made between two sets of players of equal numbers; a large ball made of light materials,—a blown bladder, cased with leather, is the best,—is placed between them, and the object of each party is to kick the ball across the goal, and to prevent it from passing their own.

The rustic boys use a blown bladder, without the covering of leather, for a foot-ball, putting peas and horse-beans inside, which occasion a rattling as it is kicked about.

GOFF, OR BANDY-BALL.

In the northern parts of the kingdom, Goff is much practised. It answers to a rustic pastime of the Romans, which they played with a ball of leather, stuffed with feathers, and the Goff-ball is composed of the same materials to this day. In the reign of Edward the Third, the Latin name "*Canibuca*," was applied to this pastime, and it derived the denomination, no doubt, from the crooked club, or bat, with which it was played; the bat was called a "*Bandy*," from its being bent, and hence is frequently called, in English, "*Bandy-ball*."

Goff, according to the present modification of the game, is performed with a bat, the handle of which is straight, and usually made of ash, about four feet and a half in length; the curvature is affixed to the bottom, faced with horn, and backed with lead. The ball is a little one, but exceedingly hard, being made with leather, and stuffed with feathers. There are, generally, two players, who have each of them his bat and ball. The game consists in driving the ball into certain holes made in the ground; he who achieves which the soonest, or in the fewest number of strokes, obtains the victory. The Goff-lengths, or the spaces between the first and last holes, are sometimes extended to the distance of two or three miles; the number of intervening holes is optional, but the balls must be struck into the holes and not beyond them. When four persons play, two of them are sometimes partners, and have but one ball, which they strike alternately, but every one has his own bandy. Goff was a fashionable game among the nobility at the commencement of the seventeenth century, and it was one of the exercises with which Prince Henry, eldest son to James the First, occasionally amused himself.

STOOL-BALL.

Stool-ball is frequently mentioned by the writers of the three last centuries, but without any proper definition of the game. Doctor Johnson tells us, it is a play where balls are driven from stool to stool, but does not say in what manner, or to what purpose. It consists in simply setting a stool upon the ground, and one of the players taking his place before it, while his antagonist, standing at a distance, tosses a ball with the intention of striking the stool; it is the business of the former to prevent this by beating it away with the hand, reckoning one to the game for every stroke of the ball; if, on the contrary, it should be missed by the hand, and touch the stool, the players change places; the conqueror at this game is he who strikes the ball



MINOR SPORTS.

13

most times before it touches the stool. In some parts of the country, a certain number of stools are set up in a circular form, at a distance from each other, and every one of them is occupied by a single player; when the ball is struck, which is done as before, with the hand, they are every one of them obliged to alter his situation, running in succession from stool to stool, and if he who threw the ball can regain it in time to strike any one of the players before he reaches the stool to which he is running, he takes his place, and the person touched must throw the ball, until he can, in like manner, return to the circle.

TRAP, BAT, AND BALL.

With the form of the trap, our young readers are, doubtless, acquainted; it will be only necessary for us to give the laws of the game. Two bounda-



ries are equally placed, at a great distance from the trap, between which, it is necessary for the ball to pass, when struck by the batsman; if it fall outside either of them, he loses his innings. Innings are tossed up for, and the player who wins, places the ball in the spoon of the trap, touches the trigger with the bat, and, as the ball hops from the trap, strikes it as far as he can. One of the other players (who may be from two to half-a-dozen) endeavours to catch it. If he do so before it reaches the ground, or hops more than once, or if the striker miss the ball when he aims at it, or hits the trigger more than twice without striking the ball, he loses his



NORTHERN-SPILL.

Northern-spill is played with a trap, and the ball is stricken with a bat, or stout stick, at the pleasure of the players, but the latter is most commonly used. The performance of this pastime does not require the attendance of either of the parties in the field to catch or stop the ball, for the contest between them is simply, who shall strike it to the greatest distance in a given number of strokes; the length of each stroke is measured, before the ball is returned, by means of a cord made fast at one end, near the trap, the other end being stretched into the field by a person stationed there for that purpose, who adjusts it to the ball, wherever it may be; the cord is divided into yards, which are properly numbered in succession, so that the person at the bottom of the ground can easily ascertain the distance of each stroke by the number of yards, which he calls to the players, who place it to their account, and the ball is thrown back. This pastime possesses but little variety, and is by no means so amusing to the bystanders as Trap-^d H.

ROUNDERS.

In the west of England this is one of the most favorite sports with a bat and ball. In the metropolis, boys play a game very similar to it, called Feeder. In rounders, the players divide into two equal parties, and chance decides which shall have first innings. Four stumps or posts are placed from twelve to twenty yards asunder, as *a*, *b*, *c*, *d*, in the margin; another is put at *e*; one of the party which is out, who is called the pecker or feeder, places himself at *e*. He tosses the ball gently toward *a*, on the right of which one of the in-party places himself, and strikes the ball, if possible, with his bat. If he miss three times, or if the ball, when struck, fall behind *a*, or be caught by any of the players, who are all scattered about the field except one who stands behind *a*, he is out, and another takes his place. If none of



MINOR SPORTS.

21



SPORTS OF AGILITY AND SPEED.

MANY of the previous sports with balls and tops, are in part games of agility and speed, and so also are several of those which will be found among the Miscellaneous Minor Sports; but the following pastimes are exclusively games either of speed or agility, for which no implements are necessary.

LEAP-FROG.

This is a most excellent pastime. It should be played in a spacious place, out of doors if possible; and the more there are engaged in it, provided they be of the same height and agility, the better is the sport. We will suppose a dozen at play:—Let eleven of them stand in a row, about six yards apart, with all their faces in one direction, arms folded, or their hands resting on their thighs, their elbows in, and their heads bent forward, so that the chin of each rests on his breast, the right foot advanced, the back a little bent.



The manner of playing Leap-Frog about London is different, and as we think, much inferior in safety, appearance, and amusement :—A lad places himself with his hands on his knees, his body nearly doubled, and his side, instead of his back, turned toward the leapers, who, with a short run, take their leap at some distance from the lad who is to be vaulted over ; he who takes his leap the farthest off, is reckoned the best player. This, it may be readily imagined, is by no means so lively as the real game of Leap-Frog which we have above described. The boy, who is to be leaped over, receives the greater shock from the jumpers ; and he is in more danger of being thrown down by, or having a blow on his head from, their knees.

PRISONERS' BASE.

Prisoners' Base is truly a capital game for cold weather. The best number to play at it is six or eight on each side, but there is no objection to more or fewer players. The choice of partners is decided by chance ; a line, ten or twelve yards in length, is drawn about a dozen yards from a wall ; other lines are drawn at each end of the first, reaching thence to the wall, and the third from the middle of the first line to the wall ; one party takes possession of the bounds on one side of this middle, and the other set of players takes the bounds on the other side of it. Two prisons are also marked in a line with each other, at from one to two hundred yards (as convenience will permit) from the front of the bounds ; the prison belonging to one party must be opposite the bounds of the other. The game is now commenced by a player from one side running out mid-way between the bounds and prisons ; a player from the other side immediately follows, and he may be pursued by one of his adversaries, who in like manner may be followed by a player from the side which began the game, and so on ; both parties being at liberty to send out as many as they think fit. The object of each player is to come up with, or intercept and touch any player of the opposite side, who has left the bounds before him ; he is not at liberty to touch any that have started after him, it being their privilege, on the contrary, if they can, to touch him before he can get back within his bounds again. A player is allowed to touch one of the opposite party only each time he quits bounds, and after having touched an adversary, he is exempt from being touched on his return to bounds. Every player who is touched, goes to the prison belonging to his party, where he must remain until one of his own side (who must start from bounds after the prisoner has been within the line of the prison) be able to reach him, without being touched in his run from bounds to prison, by any of the opposite party who may have left their bounds after him. When thus released, neither he nor the player who has relieved him is to touch or be touched in their return to bounds again. The game is won by that side which has all the players of the other in prison at the same time.



MINOR SPORTS

23

SADDLE MY NAG

Two players toss up for choice of partners; six or eight on each side. The best number: after choosing, the two leaders toss up for innings, as who goes then ranges himself and his associates in the following manner:—One player places himself almost upright, with his hands resting against a wall or tree, a second puts his head against the skirts of the first, the third against the skirt of the second, and so on until they are all ranged. They must either hold by the trousers of the player who is before them, cross their arms on their breasts, or lean them on their knees. One of the winning party now begins by taking a run, placing his hands upon the back of the outer player on the other side, and leaping as far forward on the range as he possibly can, in order to afford room for his partners behind him, who follow in succession, until all are on the backs of the other party. If they can all remain on without touching the ground with the hand or any other part, while the leader counts twenty, or if any of the other party sink beneath the weight, or touch the ground with their hands or knees to support themselves, the riders keep their innings, and go on again. If on the contrary, or in case there be not room enough for them to leap on, or they cannot keep on the backs of those who are on before them, they lose, and the other party become riders, and they nags.

PUSS IN THE CORNER.

This is a very simple, but at the same time, a very lively and amusing game. It is played by five only; and the place chosen for the sport should be a square court or yard with four corners, or any place where there are four trees or posts, about equi-distant from each other, and forming the four points of a square. Each of these points or corners is occupied by a player; the fifth, who is called *Puss*, stands in the centre. The game now commences; the players exchange corners in all directions: it is the object of the one who stands out, to occupy any of the corners which may remain



Cock-a-shoddo-doo!—Warning!” He then runs out, and touches the first he can overtake, who must return to bounds with him. These two then (first crying “Warning” only) join hands, and each of them endeavours to touch another; he also returns to bounds, and at the next sally joins hands with the other two. Every player who is afterward touched by either of the outside ones, does the like, until the whole be thus touched and taken. It is not lawful to touch an out-player after the line is broken, either accidentally, or by the out-players attacking it, which they are permitted to do. Immediately a player is touched, the line separates, and the out-players endeavour to catch those belonging to it, who are compelled to carry those who capture them, on their backs, to bounds. When three are touched, he who begins the game is entitled to join the out-players.

FOLLOW MY LEADER.

Without a bold and active leader this sport is dull and monotonous; with one possessing the necessary qualifications it is quite the contrary. Any number may play at it. A leader is fixed on, and the other players range themselves in a line behind him. He commences the sport, by some feat of agility, such as leaping, hopping, or climbing, and his followers then attempt to perform it in succession. He then goes to another trial of skill; the others, or so many of them as are able to do so, follow his example, and thus the sport proceeds until the parties think fit to cease. The most nimble and active should, of course, be chosen for a leader; he should perform feats of such difficulty as to render the sport interesting, at the same time avoiding such as he knows can only be undertaken by himself, or by one or two of his followers. If one boy can perform a feat, which those who are placed before him in rank fail in attempting, he takes precedence of them until he is, in like manner excelled by any of those who are behind him.

TOUCH.

This is a sport of speed. Six or eight is the best number to play at it.



SPORTS WITH TOYS.

The Sports with Toys are very numerous; those which are most usual in the play-ground are with the kite, the hoop, the sucker, the pea-shooter, and two or three others; of each of which we offer our readers a description

THE POP-GUN.

The Pop-gun is made of a piece of wood, from which the pith has been taken; a rammer must be made, with a handle of a proper length, which

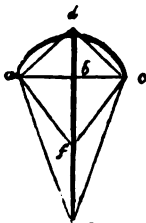
THE PEA-SHOOTER.

By means of a tube of tin or copper, a pea may be propelled from the mouth, by the mere force of the breath, to a very considerable distance. The natives of Macouslie, with a cane tube, about twelve feet long, propel arrows with their breath, with such force and dexterity, as to bring down different sorts of feathered game.

THE KITE.

To construct the Kite, you must, in the first place, procure a straight stick of deal for the upright or straighter, and a thin hoop, or a pliant piece of hazel for the bow or bender. Fasten the bender by its centre, with string, to the upright, within a little distance of its top; then notch the two ends of the bow, and fasten them to the upright by a string, which is made fast at each of the ends, and turned once round the upright, as *a, b, c*; the string must then be carried up to the junction of the bow and straighter, and made fast at *d*, and thence to *e*; from *e*, it must pass through a notch at *f*, up to *e*; then down to *f*, where it must be tied in a notch cut for that purpose, and up to *a* again. Your skeleton being now complete, your next task is to paste a sufficient quantity of paper together to cover it, and afford a hem to be passed over the outer edges.

Next, bore two holes in the straighter, one about a fifth of the whole length from the top, and the other rather less from the bottom; run through these, and fasten, by a knot at the two ends, your belly-band string, to which the ball of string, by which the kite is flown, is afterward fixed. The wings are made of several sheets of writing paper, half cut in slips, rolled up, and fastened at *a* and *c*. The tail, which should be from ten to fifteen times the length of the kite, is made by tying bobs of writing paper, four times folded,





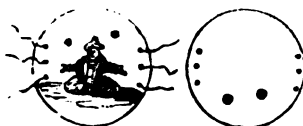
MINOR SPORTS.

27

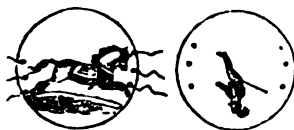
amazing speed, in a carriage drawn by kites, in the most safe and accurate manner possible, notwithstanding the variations of the wind and the crook edness of the roads.

THE THAUMATROPE.

This very amusing toy is made and exhibited in the following manner . Cut out a circular piece of card, to which fasten six bits of string, as in the



cut. Draw on one side of it a figure with balls, and on the other, two balls only, as represented in the margin; when taking one of the strings between the forefinger and thumb of each hand, close to the card, twist or twirl it rapidly round, and according to which pair of strings you use, the figure will seem to be tossing two, three, or four balls in different directions. Various cards and devices may be used ; for instance, you may draw a bird on one side, and a cage on the other ; by only using the centre pieces of string, the bird will seem to be in the



cage or aviary ; a horse on one side, and a jockey on the other, as in the cut, (taking care to reverse the figures, or draw them upside down to each other,) and by using the different pairs of strings, you may cause the rider to appear upon, leaping under, or by the side of the horse, as you please. For other designs, we suggest a tight rope and a dancer ; a body and a head ; a candle and a flame ; a picture and its frame, &c

BATTLEDORE AND SHUTTLECOCK.

Battledores and Shuttlecocks are to be obtained cheap at all the book- stores. The game is played by two persons, who, with the battledores, strike

**THE SUCKER.**

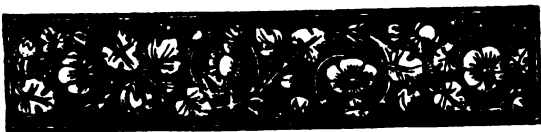
Cut a circular piece out of stout leather; bore a hole through its centre and pass a string, with a knot to prevent the end escaping, through this hole. Soak the leather well in water before you use it; when thoroughly soaked, place the leather on a stone, press it well down with your foot, and then taking the string, you may, by your sucker, raise a considerable weight.

THE HOOP.

Every body knows how to trundle the Hoop in the usual way; several pairs of tin squares are sometimes nailed to the inner part of the hoop, which produce, in the opinion of some lads, an agreeable jingle. In some parts of England, boys drive their hoops one against the other, and the player whose hoop falls in these encounters, is conquered.

THE WATCH-SPRING GUN.

Neatly cut a bit of wood, about four inches long, into the form of the stock of a pistol or gun; scoop a groove in the upper part of it; in this groove place a large quill, open at both ends, fasten it on with waxed thread, and let it project beyond the point of the stock and reach as far as the middle of it; next, procure an old watch-spring, which may be bought cheap at a watch-maker's, cut off a piece of it about as long as the quill, bend it backward, and tie one end of it firmly to the upper part or but-end of the stock. Then bore a small hole through the middle of the stock about an inch from the mouth of the quill; cut a pin in two, fasten one half of it, by its head, to a bit of thread, the other end of which fasten to the thread that binds on the spring; this is the trigger, and your gun is complete. To use it, place a little arrow, or a shot, in the groove between the mouth of the quill and the hole in the stock; put the pin through this hole, and bend



MINOR SPORTS.

29



MISCELLANEOUS SPORTS.

Under this head we intend to describe a variety of amusing sports and recreations, which could not, in strictness, be inserted among any of the preceding classes.

BLIND-MAN'S BUFF.

This popular, old-fashioned, and delightful pastime, is so well known, as to render any description of it unnecessary. There is, however, a variation of it called *Shadow Buff*, which is less known, but equally amusing. A large piece of white linen is suspended smoothly at one end of a room; at a little distance from it, *Buffy*, with his face toward the linen, is seated on a low stool. Directly in a line, and about a yard behind him, a table is placed with a candle on it; all the other lights must be extinguished. The players then walk one by one, between the table and *Buffy*, (who must not turn his head,) limping, hopping, and grimacing as they please, so as to throw the



do so without letting the rope go, or pulling the bear from his seat, the play or so touched takes the place of the bear. Each bear has the privilege of shooing his own master; being bear once, or even oftener, does not exonerate a player, if fairly touched, from becoming so again.

DICK, DUCK, AND DRAKE.

From this game comes the proverb which is frequently applied to a spend-thrift. "He is making ducks and drakes of his money." It is played by skimming, or what boys call shying, bits of slate or flat stones along the surface of a river or pond. If the thing thrown touches the water and rebounds once, it is a dick; if twice, a duck; if thrice, a drake. He who makes his slate or pebble rebound the greatest number of times, wins the game.

SLIDING.

Sliding is one of the diversions ascribed to young men of London by Fitzstephen, and, as far as one can judge from his description of the sport, it differed not in the performance from the method used by the boys of our own time. He mentions another kind of pastime upon the ice, which is even now practised by boys in several parts of England; his words are to this effect: "Others make a seat of ice, as large as a mill-stone, and having placed one of their companions upon it, they draw him along, when it sometimes happens, that moving on slippery places, they all fall down headlong."

Sledges are, now-a-days, also used, which being extended from a centre by means of a strong rope, those who are seated in them are moved round with great velocity, and form an extensive circle. Sledges of this kind were set upon the Thames in the time of a hard frost at the commencement of the last century, as the following couplet, taken from a song written upon that occasion, plainly proves.

"While the rabble in sledges run giddily round,
And nought but a circle of folly is found."

SKATING.

Skating is by no means a modern pastime, and probably the invention proceeded rather from necessity than the desire of amusement. It is a boast of a northern chieftain, that he could traverse the snow upon skates of



MINOR SPORTS.

31

against the ice, and moved with celerity, equal, says the author, to a bird flying through the air, or an arrow from a cross-bow; but some allowance, we presume, must be made for the poetical figure: he then adds, "at times, two of them thus furnished agree to set opposite one to another at a great distance; they meet, elevate their poles, attack and strike each other, where one or both of them fall, and not without some bodily hurt, and even after their fall are carried a great distance from each other by the rapidity of the motion, and whatever part of the head comes upon the ice it is sure to be laid bare."

The wooden skates shod with iron or steel, which are bound about the feet and ankles like the talares of the Greeks and Romans, were, most probably, brought into England from the low countries, where they are said to have originated, and where, it is well known, they are almost universally used by persons of both sexes when the season permits. Some modern writers have asserted that "the metropolis of Scotland has produced more instances of elegant skaters than perhaps any other county whatever; and the institution of a skating club has contributed not a little to the improvement of this amusement." Strutt, in noticing this, observes that when the Serpentine river in Hyde Park was frozen over, he saw four gentlemen there dance, if the expression may be allowed, a double minuet, in skates with as much ease and perhaps more elegance, than in a ball-room; others again, by turning and winding with much adroitness, have readily in succession described upon the ice the form of all the letters in the alphabet.

SWINGING.

The construction of the swing is simple: two ropes of equal lengths, are to be suspended from any branch or cross piece of timber, of adequate strength; at the bottom of these ropes a seat is to be securely fastened, and the party who takes the seat must be propelled by another on the ground; a rope for this purpose must be fastened to the back part of the seat.

FRENCH AND ENGLISH.

This game is played by two parties, whose numbers are equal; they all take hold of a rope, and the object of each party is to pull those belonging to

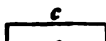


diminished from the middle to both the ends, in the shape of a double cone; by this curious contrivance, the places of the trap and ball are at once supplied, for when the cat is laid upon the ground, the player, with his cudgel, strikes it smartly, it matters not at which end, and it will rise with a rotatory motion, high enough for him to beat it away as it falls, in the same manner as he would a ball.

There are various methods of playing the game of cat, but we shall only notice the two that follow. The first is exceedingly simple, and consists in making a large ring upon the ground, in the middle of which the striker takes his station; his business is to beat the cat over the ring. If he fail in so doing he is out, and another player takes his place: if he be successful, he judges with his eye the distance the cat is driven from the centre of the ring, and calls for a number, at pleasure, to be scored toward his game; if the number demanded be found, upon measurement, to exceed the same number of lengths of the cudgel, he is out; on the contrary, if he do not, he obtains his call. The second method is to make four, six, or eight holes in the ground, in a circular direction, and as nearly as possible, at equal distances from each other, and at every hole is placed a player with his cudgel; one of the opposite party, who stand in the field, tosses the cat to the batsman who is nearest him, and every time the cat is struck, the players are obliged to change their situations, and run once from one hole to another in succession; if the cat be driven to any great distance, they continue to run in the same order, and claim a score toward their game, every time they quit one hole and run to another; but if the cat be stopped by their opponents, and thrown across between any two of the holes before the player who has quitted one of them can reach the other, he is out.

HOP-SCOTCH.

In some parts of England this game is called Pottle. It is played with an oyster-shell, in the following manner:—Draw, with chalk, on the ground, a figure similar to the cut in the margin. Toss up for innings. He who wins stands at the * and throws the shell into No. 1, which is called the first bed; he then





MINOR SPORTS.

33

counting back, reversing the numbers. After this, the player puts the shell into No. 1, hops into that bed, scuffles the shell into 2, and so on to 6, and back again in the same manner, bed by bed, to the *. Lastly, he places the shell into No. 1, puts his right foot in the bed, and scuffles the shell through all the beds, beyond the further line of 6 at one jerk. If the player who gets the innings do all this correctly, he wins the game. If, however he put himself out, as hereafter described, the second player takes the innings; if the latter put himself out, without going through the game, the first takes up his own game, where it was when he went out; the second also does the like with his, if the first gets out a second time. When there are more than one innings, the first who goes through the game, as above stated, wins. A player loses his innings in either of the following cases:— If he throw the shell into the wrong bed, or on the line, or put two feet into one bed, or a foot upon the lines, or do not scuffle the shell out of the bed in which it lies at the first attempt, or put his hands to the ground, or throw or scuffle the shell beyond line *c*, (except in the last, or what is called "the long scuffle,") or outside the lines *a b*; or if, in going forward, he put his leg into 3 before 2, or the contrary when coming back; or if, when scuffling the shell through on the hop, he drive it beyond the next bed in which it lies; or if, in any part of the game, when he has stepped into a bed, he take more than one hop in order to get near the shell; or if he hop after he has scuffled it; or, lastly, if, in the long scuffle, he do not, at one effort, send it with his foot from beyond the line of *c*. But observe, that when he has cast the shell into No. 2, or any bed beyond it, he is not compelled to scuffle it out, that is, beyond the line *d*, at one effort.

KING OF THE CASTLE

This is a very unexceptionable and simple, but nevertheless, lively sport. One player places himself on the top of a little mound or hillock; he is the King of the Castle, and he endeavours to retain possession of his post, as long as possible, against the attacks of his playmates, who endeavour, one at a time, to push him off. If he be driven off the mound or hillock, the player who dethrones him takes his place.

SEE-SAW

WHOOF.

This game is played as follows :—All the players but one, collect at a place called “home,” while one goes off to hide himself. When ready, he



shouts “Whoop oh !” the others then sally out to find him ; he who discovers the hidden player, calls out “Whoop oh !” the hidden player then breaks from his concealment, and if he can catch one of the others, the one so caught must carry him on his back to “home.” It is then the boy’s turn who has made the discovery to go and hide himself, and the others endeavour to discover his lurking place, as before.

HIDE AND SEEK.

This is very like the preceding game ; a handkerchief, or some other trifle, is concealed by one player, and the rest attempt to find it ; the discoverer takes the next turn to hide the article. It is a custom, in this game, for the boy who has hid the article to encourage those who approach it, by telling them that they burn, and to warn them of their departure from it by saying they freeze.

HIPPAS.

The Greeks had a pastime called hippas, which, we are told, was one



MINOR SPORTS.

35

the king and his men pass through." In obedience to this mandate, the player who stands at the opposite end of the line and the one next him, lift their joined hands as high as possible; the other outside player then approaches, runs under the hands thus elevated, and the whole line follows him, if possible, without disuniting. This is threading the needle. The same dialogue is repeated, the respondent now becoming the inquirer, and running between the two players at the other end, with the whole line after him. The first then has his turn again.

DUCK.

Duck should be played by a number exceeding three, but not more than six or eight. A large stone with a smooth top is placed on or fixed into the ground, and an offing marked at eight or ten yards distance. Each of the players being previously provided with a large pebble, or stone, double the size of a cricket ball, or thereabout, one of them, by chance or choice, becomes duck; that is, he places the pebble or stone with which he is going to play, on the large stone, and stands a little on one side. The others then cast their pebbles or ducks at it, in turn, from the offing, each endeavouring to knock it off its place. Each player, as soon as he has cast his duck, watches for an opportunity of carrying it back to the offing, so as to cast again. If the player who is duck, can touch him after he has taken up his pebble, and before he reaches the offing, provided his own pebble remain on the large stone, then the player so touched becomes duck. It sometimes happens that three or four of the out-players' ducks lie so close together, that the player who is duck can stand in a situation to be within reach of all of them; in this case, they cannot, without running the risk of being touched, pick up, until one of those who are at the offing is lucky enough to strike the duck off the large stone; then, before its owner can replace it, which he must do before he can touch a player, they all take up their ducks and run to the offing, where, of course, they are safe.

HUNT THE SLIPPER.

This is usually an in-door game, although there is no other objection to its being played on a dry piece of turf than that the slipper cannot be heard when struck by its momentary possessor, when passing round the joyous ring. Several young persons sit on the ground in a circle, a slipper is given to them, and one, who generally volunteers to accept the office in order to begin the game, stands in the centre, and whose business it is to "chase the slipper by its sound." The parties who are seated, pass it round so as to



PALL MALL.

Pall-mal is a game wherein a round piece of box is struck, with a mallet, through a high arch of iron, which he that can do at the fewest blows, or a the number agreed upon, wins. It is to be observed, that there are two of these arches, that is, one at either end of the alley. The game of Mall was a fashionable amusement in the reign of Charles II., and the walk in St James's Park, now called the Mall, received its name from having been appropriated to the purpose of playing at Mall, where Charles himself, and his courtiers, frequently exercised themselves in the practice of this pastime. The denomination of "Mall," given to this game, is evidently derived from the mallet or wooden hammer used by the players to strike the ball. It will be perceived that this game is rather similar to Goff; we have been told that it still exists in some parts of England; but we must confess that it never fell under our personal observation.

HOP, STEP, AND JUMP.

This is a sport of emulation; the object is to ascertain which of the players concerned can, eventually, go over the greatest portion of ground in a hop, a step, and a jump, performed in succession, and which may be taken either standing or with a run, as may be agreed, at the outset, between the players.

DRAWING THE OVEN.

Several players seat themselves on the ground, in a line, and in such a manner that each may be clasped round the body by the player who is seated behind him. When all are thus united, two others take the one who is at the extremity of the line by the two hands and pull until they separate him from the grasp of the one who is behind him. They then take the second in the same manner, and so on until they have thus drawn the whole line.

THE LANE LANPLIGHTERS.

Two boys kneel, each on one knee only, holding the other leg off the ground, one opposite the other; a lighted candle is given to one, and another candle, not lighted, to the other; they then attempt to illuminate the latter; but, being in equilibrium on one knee, and liable to be thrown off their balance by the least motion, they will find this so difficult a matter as to cause great diversion to the spectators.

THE JUMPING ROPE.

A long rope is swung round by a player at each end of it; when it moves tolerably regular, one, two, or even more boys, step in between those who hold the rope, suffering it to pass over their heads as it rises, and leaping up so that it goes under their feet when it touches the ground, precisely as in the case of a common skipping-rope. The principal difficulty in this sport is, to run between the players at the proper moment of time, that is, just as



the rope is at highest elevation, so as to be ready to jump over when, in its circuit, it comes toward the feet. Care must be taken that due time be kept in the leaps, so that they may perfectly accord with the motion of the rope.

There is another mode of playing with the long skipping-rope, namely, by the player at one end of it, advancing a step or two toward the other, keeping the hand which holds the rope on the outside, and then, with the assistance of the player at the other end, turning the rope round, and skipping over it in its circuit.

THE WOODEN BOTTLE.

This is a sport similar to "The Lame Lamplighters," frequently played by the parlour fire-side, in holyday time :—an individual seats himself on a wooden bottle which is placed sideways upon the floor, and endeavours, with a burning candle, which he holds in his right hand, to light another in his left

DROPPING THE 'KERCHIEF.

A number of players join hands so as to make a circle ; one only stands out ; he walks round the outside of the circle, and drops a handkerchief behind which player in the circle he thinks fit. The party behind whom the handkerchief is thus dropped immediately follows the one who dropped it : those who stood on each side complete the circle by joining hands, and the chase commences. The pursuer is bound to follow precisely the course of the pursued, who winds in and out under the arms of the other players, who elevate them for his accommodation, and endeavours, by all the means in his power, to puzzle and elude him. If he succeed in so doing, that is, if the pursuer make a blunder in his course, he returns to his place in the circle, and the first player prepares to drop the handkerchief behind one of the players again. When he is fairly overtaken by the player behind whom he has last dropped the handkerchief, the latter takes his place, and he joins hands in the circle.

BUCK.

This is a miniature resemblance of "Saddle my Nag;" but it neither requires speed, nor even agility. It is a sport for two boys only, who should be nearly equal in size and strength. A third, who does not join in the game, stands by as an umpire. The game commences by one of the players giving a back ; that is, placing his arms across his breast, or resting them on his knees, stooping forward so as to bring his back nearly horizontal with his head, which he supports against a post, wall, tree or whatever may be convenient for the purpose. It is usual, but we think quite unnecessary, for the player who gives the back to be blindfolded ; we say unnecessary, because the only object for doing this is to prevent him seeing what is going on behind, or, rather, above his back, which he cannot possibly do, if he keep his head in a fair and proper position ; and the umpire should see that he



does so. The first player having thus taken his position, the second leaps, or vaults, astride on his back, holds up as many of the fingers of one hand as he pleases, and says, "Buck, buck, how many horns do I hold up?" The player who gives the back makes a guess; if he name the right number the other player becomes Buck, and gives him a back. If, however, his guess is an incorrect one, the rider gets off, vaults on again, holds up the same or a different number of fingers, and asks the same question as before; this is repeated until the Buck name the true number. It is the business of the umpire to see that there is no foul play on the part of the rider. We should suggest that it would be an improvement on this quiet, simple game, for the umpire to be made a third player; so that when the Buck's guess is correct, the rider should give a back, the umpire become rider, and the Buck umpire: thus, instead of the place of umpire being a mere idle vocation, the game would be productive of amusement and exercise to all three of the boy engaged in it.

THE SNOW STATUE.

In those days, when winter clothes the surface of the earth with a mantle of snow, and many of the amusements of the play-ground are thereby suspended, it is a custom with boys, as some of our young readers, doubtless, very well know, to make that which is an impediment to their old recreations, a material for new ones. Then do snow-balls, harmless if lightly compressed, but otherwise if strongly kneaded, fly about in abundance. Caves and even pigmy fortresses, are constructed; the rolling ball, which is first round! by the little hands of a child, becomes, in a few hours, by driving it over the snow, too big for a man to move. When the joyous tenants of the play-ground have become fatigued with rolling the ball, or it has acquired a size and weight superior to their united powers, it is a common practice with them to cut a rude resemblance of a man out of the mass, adding to its height



MINOR SPORTS.

THE SLING.

Cut out an oval piece of leather, about two inches wide at the broadest part; at each of the ends, fasten a leathern thong, or piece of cord,—one of these cords, or thongs, should be longer than the other; place a stone in the broadest part of the leather, twist the longest thong twice or thrice round your hand, hold the other lightly between your thumb and fore-finger, whirl it round several times, let go the shorter thong, and the stone will be shot to a great distance. Small lumps of clay kneaded to the point of a pliant switch, may be jerked to a height scarcely credible.





DIAMOND & BOWER.





ARCHERY.



To save his own and Albert's life,
Tell is to shoot an apple from the head
Of his own child !

WILLIAM TELL



so the sheriffs of most of the English counties, to provide five hundred white bows, and five hundred bundles of arrows, for the then intended war against France. The famous battle of Cressy was fought four years afterward, in which, it is stated, that we had about two thousand archers, opposed to about the same number of French. In the fifth year of the reign of Edward IV. an act was passed, that every Englishman, and Irishman dwelling with Englishmen, should have an English bow of his own height, which is directed so he made of yew, wych, hazel, ash or awburne, or any other reasonable tree, according to their power. The next chapter also directed, that butts should be made in every township, which the inhabitants were obliged to shoot at, every feast day, under the penalty of one half-penny when they should omit this exercise. During the reign of Henry VIII. several statutes were made for the promotion of Archery. An act of parliament, in Elizabeth's reign, regulated the price of bows. Charles I. is said to have been an Archer; and, in the eighth year of his reign, he issued a commission to prevent the fields near London being so enclosed as "to interrupt the necessary and profitable exercise of shooting." So lately as the year 1753, targets were erected in the Finsbury fields, during the Easter and Whitsuntide holydays, when the best shooter was styled "Captain" for the ensuing year, and the second, "Lieutenant." Edward VI, in his journal, says, that one hundred Archers of his guard shot, before him, two arrows each, and afterward, altogether; and that they shot at an inch board, which some pierced quite through with the heads of their arrows, the board being well seasoned timber. The distance of the mark is not mentioned. As a pastime there is none, perhaps, superior to this; it is now, and for years past has been, highly popular in this country: in fact, judging from the past and the present, we may venture to predict that

The Archer's sport will never be extinct,
Until the memory of Robin Hood,
Of Cressy's well-fought field, and Chevy-Chase,
Be blotted from the tablet of our minds.

THE BOW.

The young archer should, in the first place, select a bow, that is fit and proper for his own size and strength. It is not probable that he can be



ARCHERY.

45

ARROWS

Arrows should be delicately proportioned in length and weight to the bow for which they are intended. They are used blunt or sharp, and varying in their thickness according to the fancy of the Archer. Some are made so as to taper gradually from the feathers to the pile, and some *viceversa*; others again are thickest in the centre. All arrows should have their nocks or notches cased with horn, and the nocks should be of such a size as to fit the string with exactness, and be neither too tight nor too loose. Three goose or turkey feathers are affixed to arrows; one of these, denominated the cock feather, is of a different color from the other two, and this is always to be placed uppermost.

THE STRING.

That part of the string which receives the nock of the arrow is whipped with sewing silk, to prevent the string being rubbed and weakened. If the silk should come off the string, it ought to be re-whipped without delay; otherwise, it will be in danger of breaking; and this is not the only mischief, for from the breaking of a string oftentimes ensues the snapping of the bow. It is also advisable to whip the noose and eye of the string, although many archers do not trouble themselves to do so. At one end of the bow-string an eye is made; it is left for the archer himself, bows being of different lengths, to make the other: this, to a young archer, will be found rather difficult; his best plan will be to inspect the mode of making the noose on an old string. The young archer will do well, if any of the threads of his string break, to throw it by and use another. He should never, if possible, permit the string to become twisted or ravelled; should such an occurrence take place, before it is put on again it ought to be re-twisted and waxed. A bow, five feet long when braced, should never have the string more than five inches from its centre. This rule will be a guide to the young archer in stringing his bow; whatever be its length he will of course adjust the distance in the same proportion, according to the admeasurement.

THE TASSEL.



tops, nor be drawn back to cover the first joint. The glove is used for the purpose of protecting the fingers from being hurt by the string.

THE BRACE.

The brace is worn in the bow arm to save it from being injured by the string, which, without this protection, would, in all probability, incapacitate the archer from shooting long at a time. It is made of stout leather with a very smooth surface, so that the string may glide over it without impediment.

THE QUIVER.

The quiver is for the reception of the arrows, but is never constantly worn except in roving; it is now usually made of tin, although it is occasionally constructed, as was indeed universally the case formerly, of wood or leather.

THE BELT, POUCH, AND GREASE-BOX.

The belt is buckled round the waist; the grease-box is suspended from the middle, and the pouch or bucket on the right side of it. A composition for greasing the finger of the shooting-glove, and the smooth side of the brace, when occasion may require, is kept in the box: the pouch holds the arrows for immediate use in target shooting.

THE ASCHAM.

This is a large case fitted up with the necessary drawers and compartments for the reception of the bow, stock of arrows, strings, and all the necessary accoutrements of the archer.

BUTTS.

The butt is rather pyramidal in shape, generally speaking, but it may be fashioned according to the fancy of the archer; for grown up persons, they are seven or eight feet wide, three or four feet thick at the base, and nearly



TARGETS.

Targets should be proportioned to the size and skill of the juvenile archer, and to the distance at which he stands from them. The facing is usually made of canvass which is sewn on the bass; the bass is made of straw, worked as a bee-hive. The facing has a gold centre and four circles; namely, the outer white edged with green, the black inner, white and red. Where it is not convenient to keep the targets fixed, it is better to use another kind, made of pasteboard, these being more portable, although by no means so durable, as targets made of the other materials we have mentioned. If one target only be shot at, a great deal of time is wasted in going to fetch the arrows, and again returning to the spot for shooting from: two targets are, therefore, generally used, and the archers shoot from one to the other. In Archery matches, there are generally two prizes; one for the greatest number of arrows shot into the target,—the other for the shot nearest the gold centre. Hits in the target are sometimes reckoned all alike; but there is usually a distinction made. The gold centre is the mark, and the circle which approaches nearest to it, being less in size, and consequently, more difficult to hit, and nearer the main mark itself, an arrow shot in that circle is deemed of more value, in reckoning for the prize, than if it were to take place in any of those outside it, and so in proportion with the others. A celebrated society of Archery allows the following numbers for each circle. For the gold, nine; for the red, seven; for the inner white, five; for the black, three; and for the outer white, one. A writer on this subject, however, seems to think, that the outer circles are overrated, and if nine be allowed for the centre, only three should be scored for the red; two for the inner white; and less, in proportion for the two outer circles. When the sport terminates, the value of the number of hits, and not the hits themselves, should be reckoned; and he whose score is the largest, is, of course, the victor.

As ink is by no means a convenient thing to carry into the field, and marks made with the black-lead pencil are liable to be rubbed out, it is advisable to have a pin suspended from a card, properly divided for each archer's score, and to prick down the hits with it.

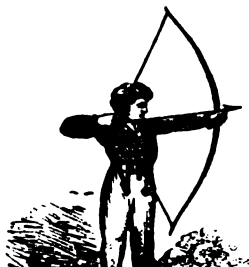
STRINGING THE BOW.



forefinger knuckle upon one edge of the bow, and the top of the thumb on the other. The bow is now to be pulled up vigorously, and the upper limb of it pressed down by the right hand, and the wrist of the left which should at the same time slide upward until the eye of the bowstring is safely placed in the nock. The middle, the ring and the little fingers, should all three be stretched out, as they are not wanted in this operation of stringing the bow; moreover, if this be not done, they are liable to be caught between the string and the bow, and thus become severely punished. The young archer should take care that the eye is well placed in the nock before he removes his left hand. He should not become impatient in the act of stringing the bow, but perform it systematically as directed; if he do not succeed, let him lay it by for a few minutes, and when he is cool make a second attempt. To unstring the bow, the short horn is to be placed on the ground; the palm of the left hand receiving the flat side of the upper limb; the string should be upward; the handle is then to be pressed with the right arm so as to slacken the string; when the latter becomes loose enough, the eye is to be brought out of the nock, by the thumb of the left hand.

POSITION.

The face is to be turned toward the mark, but no part of the body, which, if the mark be north, should



be turned toward the east; the head should be rather inclined; the left hand, with the bow in it in a perpendicular position, is to be held out straight toward the mark; the arrow is to be brought well toward the ear and not the eye, on the left side of the bow and under the string; the forefinger of the left hand passes over it; by the other hand the nock is placed in the string at the proper place, with the cock feather uppermost; when this is done, the forefinger of the left hand is removed and placed round the bow. While the left hand is raising the bow, the right should be drawing the string



ARCHERY.

49

FLIGHT-SHOOTING.

Flight-shooting was at one time much more frequently practised with the long bow than it is at present. The object in flight-shooting is simply to ascertain which of a party can shoot to the greatest distance; this must of course, be very detrimental to bows, which are more frequently snapped in flight-shooting than at any other pastime with the long bow. No skill in aiming is requisite in flight-shooting; it is, therefore, by no means improving to the young Archer, who wishes to excel as a marksman. The longest and lightest arrows that the bow will bear are used in flight-shooting; the game is generally seven.

CLOUT-SHOOTING.

Clout-shooting is mostly practised by those who cannot conveniently set up butts or targets near home. The clout, which is quite portable, is made of a round piece of pasteboard, thirty-six inches in circumference, fastened to a stick; or it may be made of white cloth, so contrived as to roll up on a stick which is run through it. In clout-shooting, seven is the game, and all arrows tell that fall within three bows' length of the clout.

ROVING

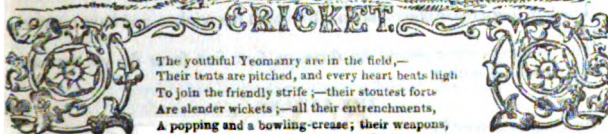
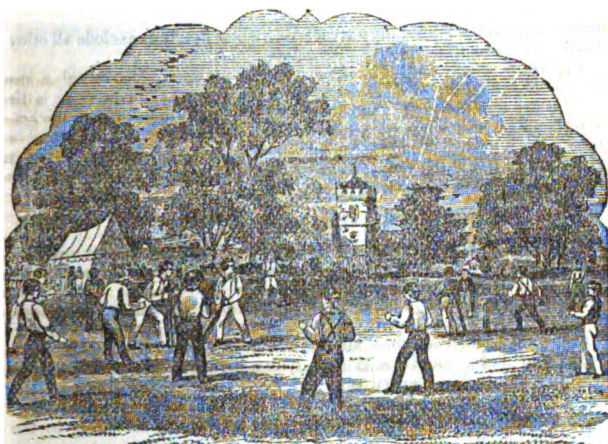
This is a very pleasant pastime with the long bow; and is, indeed, by some, preferred even to target-shooting. The parties are not restricted to any particular place, but rove about from field to field for miles around, if they think fit. The mark is any clear and conspicuous object, such as a tree or a bush. The number of the game is, in general, as in flight and clout-shooting, seven; but it may be increased or decreased, according to the inclination of the parties. If there be more than six persons in a roving party, they should divide themselves into companies; and when the first company have shot to, and walked some distance from, the first mark, the second should shoot at it: and so on with those that follow. Arrows that reach within five bows' length of the mark tell; but those which reach nearest cut the others out. In measuring the distance, the Archer does so with his own bow, from a spot in the mark which is one foot from the ground; and the first arrow is the one that is nearest, not to the mark, but to that point or spot of the mark. The Archer may measure to what part of his arrow he pleases. He who shoots nearest has the privilege of indicating the next mark. It is better to use blunt-headed arrows in Roving than sharp ones; as it not unfrequently happens that the latter are driven so firmly into the mark as to make it a matter of difficulty to extract them: should this occur, it is advisable to cut away the wood around the arrow, rather than endeavour to tug it out by violence. Every Rover should carry at least a dozen arrows with him, in order to be prepared against accidents.



CONCLUDING REMARKS.

We strongly recommend the young Archer never to shoot with another person's bow; he may, very probably, break it; and in that case, a loss might ensue to the owner, which money could not remedy. When the grass is above the ankle, shoot only at a considerable elevation. After two or three arrows are shot, the Archer should cease awhile, otherwise his aim will get unsteady. If he shoot point-blank at a mark, the arrow, if it miss will strike along, and so bury itself in the grass, as to defy the keenest eye, in many instances, for a very considerable time, to discover it. This inconvenience may be remedied by shooting at a proper elevation, for then the arrow will descend in such a manner as to leave the feathers visible; they will also be saved, from that injury which frequently occurs to them, by the moisture of the grass, or ground, when shot point-blank. Arrows should not be used of different lengths, nor should the young Archer shoot alone; for in solitary shooting, he falls into habits of negligence and indifference; if he practice with others, he will strive to emulate his companions; and, instead of a careless, unskilful marksman, soon become an adept in the constant pastime of ARCHERY.





The youthful Yeomanry are in the field,—
 Their tents are pitched, and every heart beats high
 To join the friendly strife ;—their stoutest forts
 Are slender wickets ;—all their entrenchments,
 A popping and a bowling-crease ; their weapons,
 Bats ;—their ammunition, a brace of balls.

THIS truly English pastime, although long a favorite with the people of this country, never reached to a greater degree of popularity than it possesses at this time. It is a favorite with the peer and the peasant,—



paramount, and practised in so great a degree, as nearly to exclude all other manly field recreations of a similar nature.

Cricket is usually played by eleven persons on each side, though a less number is sufficient. Two umpires are to be appointed in order to settle all disputes that may arise; they are to take their stations at each wicket, and should be well acquainted with the laws of the game. The umpire at the striker's wicket should be rather behind it, so as not to be in the way of the players; and the umpire at the bowler's wicket, directly behind it, to see that the striker does not strike the ball with his leg.

BATS, BALLS, WICKETS, &c.

The bat should not be higher than twenty-one inches in the pod, and four inches and a quarter in the widest part; this is the size for men; boys must, of course, have bats in proportion to their size and strength.

The ball, for the use of men, should weigh about five ounces; for youth, however, it should be lighter.

Full-sized wickets are three stumps, which are sufficiently long to leave twenty-four inches out of the ground, with a bail, seven inches long, to fit the top. These, like the bat and ball, must be decreased in size for the young cricketer. They should be placed directly opposite to each other, at the distance of twenty-two yards for men, but varying according to the size of the player.

The bowling-crease should be in a line with the wicket, and have a return crease.

The popping-crease should be three or four feet from the wicket, and exactly parallel with it.

THE BOWLER.

Run-time is a very important part of the game, and requires great steady-



cautions not to leave the ground before the ball is out of the bowler's hand; for if he do, the bowler may put down his wicket, and he will, of course, be out. As soon as the ball is delivered, the striker may follow it, but should not run too far, so that, if no runs be obtained, he may return in time to save his wicket. The bat should be kept on the outside of the opposite partner, and care taken not to run against him.

THE WICKET-KEEPER.

The wicket-keeper should not suffer the striker to move from his ground without knocking down his wicket, which is called "stumping out."

THE FIRST SHORT-SLIP.

The first short-slip should stand so as to reach within two feet of the wicket-keeper; if the latter should go from the wicket after the ball, the first short-slip should take his place until his return; but no player should take the ball before the wicket-keeper, provided it be coming straight to him.

THE POINT.

The point should place himself in the popping-crease, about seven yards from the striker. In backing up, he should take care to give the slip sufficient room.

LEG, OR SLIP.

Leg, or slip, should stand a little back from the straight line of the popping-crease.

LONG-STOP.

Long-stop should stand a proper distance behind the wicket, to save a run, if the ball should not be stopped by the striker or wicket-keeper. The person who is placed in this situation, should not be afraid of the ball when bowled swift. He should also be able to throw in well, as it is not only the balls that pass the wicket-keeper, but to such as are just tipped with the edge of the bat, that he will have to attend. He must also be attentive in backing up.

THE LONG-SLIP TO COVER THE SHORT-SLIP.

This player must stand about the same distance from the wicket as the long-stop, in a line with the striker, between the point and the short-slip.

TO COVER THE POINT AND MIDDLE-WICKET.

This player's place is on the off side, so that if the ball should be hit to the point and middle-wicket man, and missed, he will be in readiness to receive it.



THE LONG-SLIP OFF SIDE.

He should be placed on the off side, between the middle wicket-men and the bowler, at a considerable distance in the field, so as to cover them. It is desirable to appoint a person to this situation, who can throw well and judiciously.

LONG-FIELD ON SIDE.

Long-field on side is at some distance wide of the bowler's wicket, so as to prevent a second run.

If there be more players, they may be placed to back up, or save runs, in different situations about the field.

LAWS OF CRICKET

The bowler should deliver the ball with one foot behind the bowling crease, and within the return crease. He should bowl four balls before a change of wickets, which he is to do but once in the same innings. He must be careful to toss the ball in such a way that the striker can play at it; for if he should toss it above the striker's head, or out of the bounds of the bowling-crease, the party which is in shall be allowed one notch, to be put down to the byes; and such ball is not considered as one of the four balls. When the umpire calls "In ball," the hitter may strike at it, and get all the runs he can. When an exchange of bowler takes place, no more than two balls can be allowed for practice. If the arm be extended straight from the body, or the back part of the hand be uppermost when the ball is delivered, the umpire shall immediately call "No ball."

The striker, or batsman, is always out when the ball is knocked off the stump; when a stump is bowled out of the ground; or, if the ball should, from a stroke over or under his bat, or upon his hands, (but not his wrists,) be held before it touches the ground, even if it should be pressed to the body of the catcher; or if, while he is striking, or at any other time when the ball is in play, both his feet are over the popping-crease, and his wicket put down, except when his bat be on the ground within it. Likewise, if he hit down his own wicket; or, if either of the strikers prevent a ball from being caught, the striker shall be out; or, if the ball be struck up, and the hitter wilfully strike it again; or if, in attempting to run a notch, the wicket be struck down by a throw, or with the ball in hand, before his foot, hand, or bat is grounded over the popping-crease: If the striker remove or take up his ball while in play, without being requested by the opposite party; or if, with his leg or foot, he stop a ball which has been pitched in a straight line to the striker's wicket. If "A lost ball" be called, the striker shall be allowed four notches. If the players have crossed each other in



running, he that runs for the wicket which is put down, shall be out; but if they have not crossed each other, he that has left the wicket which is put down, shall be out.

When a ball is caught, no notch shall be reckoned. When a striker is run out, the notch they were running for shall not be reckoned. While the ball is kept in the bowler's or wicket-keeper's hand, it is considered no longer in play, nor are the strikers bound to keep within their bounds, till the umpire has called "Play;" but if a player should go out of his ground, with intent to run, before the ball is delivered, the bowler may put him out. If a striker be hurt by a ball, or otherwise, during his play, he may retire from his wicket and continue his inning; and another person may be permitted to stand out for him, but not go in. If any player should stop the ball intentionally with his bat, it shall then be considered dead, and the opposite party may add five notches to the score.

If the ball be struck up, the striker may guard his wicket either with his bat or his body. If the striker hit the ball against the wicket of his partner when he is off his ground, he is out, if it have previously touched the bowler's or any of the field-men's hands, but not otherwise.

Two minutes are allowed for each man to come in, and fifteen minutes between each innings; when upon the umpires calling "Play," the party refusing to play, shall lose the match.

The umpire should observe the situation of the bowler's foot when he delivers the ball, and if it be not behind the bowling-crease, and within the return-crease, he shall call "No ball." If the striker should run a notch, the umpire shall call "No notch." The umpire at the bowler's wicket has a right to be first applied to for his decision on the catches.

SINGLE WICKET.

The game of Single Wicket is not so interesting as that of Double Wicket; but it may be played by almost any number of persons, though it is seldom played with more than four or six on a side. The business of a bowler and striker is nearly the same as in Double Wicket.

When the striker runs to the bowler's wicket, and knocks the bail from off two stumps placed there, with his bat, and returns to his own wicket without having it knocked down by the ball, he is entitled to count one notch. After he has run one notch, if he start for another, he must touch the bowling stump and turn again, before the ball crosses the play, to entitle him to another notch. He is entitled to three notches for a lost ball.

If four, or a less number are at play, then they should make all hits before the wicket, with bounds, &c. and not move off the ground, except by agreement. Where there are more than four players on a side, there should be no bounds; and all hits, byes, and overthrows, should be allowed. It is, of course, to be understood, that the bowler must bowl at the usual



distance from the wicket. No more than one minute is to be allowed between each ball. When the striker hits the ball, one of his feet must be on the ground, and behind the popping-crease; otherwise the umpire shall call "No hit." The field's-man must return the ball, so that it shall cross the play between the wicket and the bowling-stump; or between the wicket and the bounds; the striker may run till the ball shall be so returned. These are the principal rules and regulations adopted by the most experienced Cricket-players, at the game of Single Wicket. The distance between the wickets is precisely the same as at Double Wicket, consequently, the runner has twice the ground to run, in obtaining each notch; but we would suggest, that this evil might be remedied by running only a little more than half the usual distance: by this method, Single Wicket will be rendered much less fatiguing, and far more lively and amusing, at least to the **BATSMAN.**





GYMNASTICS



Enroll'd among our Gymnasts, the pale youth
Whose limbs, erewhile, weak and of muscle void,
Totter'd beneath their puny load, soon gains
The bloom of health ; and issues forth, at last,
Robust and hardy as the mountaineer.

GYMNASTIC Exercises have lately attained considerable popularity, not only in this country, but also in Prussia, and other parts of the Continent. They may be said to be a series of regular and systematic exercises, adapted to bring into play, and consequently improve, the strength and activity of the various muscles in the human frame : imparting a knowledge of the proper use of each, and teaching the pupil the means of disposing of his

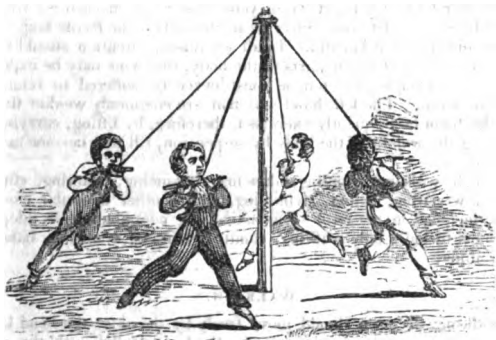


bave often achieved, ceases to be considered as any further dangerous than affording us an occasion to call forth all our energies. The well-taught Gymnast would, in a case of necessity, take a leap which few could perform, if any would venture. Leaps of great distances and heights he has oft attempted with success. By him the length, the height, and the intervening obstacles could be measured in a moment. Rehearsals of such situations and circumstances have been his daily amusement. He cannot be dismayed at danger who has often played with it, and the principles of his art have supplied him with means to disarm it of half its power. To illustrate the foregoing remarks, we shall here relate what we consider an instance of the coolness, accuracy, and presence of mind to be acquired by daily practice. Walking out one day near the city of Edinburgh, our attention was attracted to a field where the Royal Company of Archers were practising. A man, hired for the purpose, and trained to the duty, was stationed at the target, with a small flag in his hand to mark the spot where the arrows fell, the distance being very considerable. It is incredible with what accurate perception this man followed the arrow in its rapid passage along the arch it made in the sky; and with what accuracy he seemed to conjecture how near the target, or on what side it would fall. He stood close to the target, almost touching it with his right arm; one arrow flew through the air; he narrowly observed the feathered messenger advancing rapidly in its course—he stepped one step to the left, and the arrow stuck firmly in the ground a few inches to his right, *between* him and the target. He waved his flag to the spot, and a second arrow was sent; from this he escaped by darting a little to the right. To save himself from the third, he had no occasion to move from his station, as he coolly saw it deposited in the lower part of the target. It is needless to detail the rest. The arrows stuck before, behind, and on each side of him. The exercise at last concluded; and it seemed no less surprising to us, the insensibility of danger which this man, for the sake of a little gain, exhibited, than the confidence



GYMNASTICS

49



GYMNASTIC EXERCISES.

THE necessary fittings-up of a Gymnastic ground are as follows:—An horizontal bar, a vaulting-horse, a leaping-stand, parallel bars, a climbing stand, and ladders of rope and wood.

The best time for performing Gymnastics is early in the morning. Boys should proceed gradually from the more easy to the more difficult exercises; and it is most advisable to practise these sports under the eye of an expe-



exercise, begin, not with its more violent degrees, but with the more gentle, and leave off in the same manner; sudden transitions are always dangerous. Never let bodily exertion, or your attempts to harden the frame, be carried to excess: let your object be to strengthen the feeble body, not to exhaust and render it languid. In all exercises, attention should be paid to such a position of all the parts of the body, that none may be exposed to injury: for example, the tongue must never be suffered to remain between the teeth. The left hand and arm are commonly weaker than the right; let them be frequently exercised, therefore, by lifting, carrying, and supporting the weight of the body by suspension, till they become as strong as the others.

Although walking, running, dancing, balancing, vaulting, climbing,umping, wrestling, riding, swimming, and all other muscular exercises, may be included in the term Gymnastics, the common course adopted at the schools includes only walking, running, jumping, vaulting, balancing, and climbing.

WALKING.

In walking, the arms should move freely by the side, the head be kept up, the stomach in, the shoulders back, the feet parallel with the ground, and the body resting neither on the toe nor heel, but on the ball of the foot. On starting, the pupil should rise one foot, keep the knee and instep straight, the toe bent downward. When this foot reaches the ground, the same should be repeated with the other. This should be practised until the pupil walks firmly and gracefully.

RUNNING.

In running, the legs should not be raised too high; the arms should be nearly still, so that no unnecessary opposition be given to the air by needless motions. Running in a circle is excellent exercise, but the direction should be occasionally changed, so that both sides may be equally worked.

JUMPING.

The first rule in jumping is, to fall on the toes and never on the heels. Bend the knees, that the calves of the legs may touch the thighs. Swing the arms forward when taking a spring, break the fall with the hands, if necessary; hold the breath, keep the body forward, come to the ground with both feet together, and in taking the run, let your steps be short, and increase in quickness as you approach the leap. Begin with a moderate height or breadth, and increase both as you improve.



GYMNASTICS

61

PARALLEL BARS.

Begin by raising the body by the hands, and then moving the hands alternately backward and forward, until you go along the bars each way by means only of your hands. Then move or jump with both hands at once. The swing is performed by supporting the body by the arms, with the stomach upward, until the toes are in a straight line with the head; when the pupil can do this with ease, he should throw his body from this position over the bar to the right or left. The movement of lowering the body by bending the elbows is done by drawing up the feet toward the hams, and sinking gradually until the elbows are even with the head; rise again by straightening the arms, and repeat the exercise several times. Many other exercises may be performed on these bars, which will occur to the pupil in the course of his practice.



HORIZONTAL BAR

The first position is taking hold of the bar with both hands, and raising the body until the chin is on a line with the knuckles. When you can look over the bar in this manner with ease, place the hands on the further side of the bar from you, and raise the body as before. In the next exercise, the body is raised from the ground by both hands on each side of the bar, and the pupil passes, springs, or moves the hands alternately along the bar. Keep the legs close, lift the feet so as to touch the bar and sink them down again; repeat this several times, and when in this position, pass along the bar



the body raised by the hands on each side of the bar



ward; you may either return them the same way, or drop upon your toes to the ground.

THE LONG LEAP.

Make a trench, which widens gradually from one end to the other, so that the breadth of the leap may be increased daily. Keep the feet close together, and take your spring from the toes of one foot, which should be quickly drawn up to the other, and they should descend at the same instant; throw the arms and body forward, especially in descending. Take a run of about twenty paces.

THE DEEP LEAP

This is performed from a flight of steps, increasing the depth according to the progress of the pupil. The body should be bent forward, the feet close together, and the hands ready to touch the ground at the same time with or rather before the feet. We do not, however, much approve of this exercise.

THE HIGH LEAP.

Get a stand made of two upright posts, bored through with holes, through which you may pass a string at what length you please, with sand bags of sufficient weight to keep it straight, and yet not so heavy as to prevent your carrying it away with your foot, in case you touch it while leaping; or you may have holes bored to admit movable pegs to support the string, as in the cut. You must take this leap both standing and with a run; for the former, the legs should be kept together, and the feet and knees raised in a straight direction; for the latter, we recommend a short run, and a light tripping step, gradually quickened as the leaper approaches the string. You should be particularly careful not to alight on your heels, but rather on the toes and balls of the feet.



THE HIGH LEAP WITH THE POLE.

Take the pole with the right hand about the height of the head, and with the left about the height of the hips; when put to the ground, spring with the right foot, and pass by the left of the pole, over whatever you have to clear, turning round as you alight, so as to front the place you leap from.



GYMNASTICS

63

THE DEEP LEAP WITH THE POLE

This requires strength in the arms and hands. Place the pole the depth you have to leap, lower the body forward, cast off your feet and swing round the pole so as to alight with your face fronting the point you leaped from. Come to the ground, if possible, on the balls of your feet.

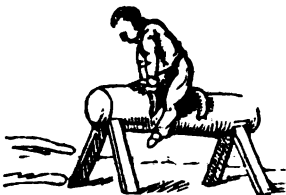
THE LONG LEAP WITH THE POLE.

This is performed precisely as the last, only that you spring forward, rather than high; it may be practised across the trench.

VAULTING.

The horse for vaulting is made of a wooden cylinder with rounded ends; two ridges are placed across it, the space between which is called the saddle, and should be wide enough apart for a person to sit between them with ease. The horse may be wadded or not, according to fancy. Leaping on the horse is performed by springing by the hands astride upon it. The body is raised in the same manner, until the feet reach high enough to stand on the horse; the hands are then to be placed on the further ridge, and the body thrown forward into the saddle.

Vaulting into the saddle may be performed with or without a run; place the hands on one of the ridges, take a spring, and turn the body on one side, so that one leg may pass over the horse, and the performer descend astride into the saddle. To vault sideways over the horse, the hands must be placed as above, and a spring made sufficient to throw the feet over the horse: one hand then leaves its hold, and you descend on the other side. To vault on or over the saddle forward, take hold of each ridge with the hands, and spring between them, so as to rest or to go over the saddle.



TO CLIMB THE POPE.

THE PLANK.

The breadth of the plank should be about two feet; its thickness, two inches; to climb it, the hands are to be placed on each side, and the feet on its surface; ascend by moving them alternately. Elevate the plank by degrees as you improve in the exercise. The progress that may be made in the ascension of the plank is astonishing. We know several Gymnasts who can ascend a plank in a perpendicular position, without difficulty. To do this, the body and feet are in a different position to that represented in the marginal cut, where the figure is merely travelling up an inclined plane; to ascend a perpendicular plank, the body is curved inward more from the shoulders downward, and the legs thrust up so that the higher one is nearly even with the hand.



ASCENDING THE LADDER.

Take hold of each side of the ladder, and ascend by moving the hands alternately. To climb the ladder by rundels, the learner must bring the elbow of the arm which happens to be the lowest, down to the ribs, before he pulls himself up by the other. To climb the ladder by one side, take hold of one side of the ladder with both hands, the palms toward the outer part of the side; move the hands alternately, and keep the legs close and steady.

TO CLIMB THE PERPENDICULAR OR SLANT POLE.

Move the legs and hands alternately, taking care, however, not to place the hands over each other, as in climbing the rope. In descending the pole, the hands are held ready to be used, if necessary, on each side of it; the legs being then a little slackened, you will descend with great ease.

FLYING STEPS.

This is a very beneficial exercise. Fix a beam firmly in the ground, with a strong iron cap, that moves in a circular horizontal position, at the top of it; four ropes are to be fixed to the cap, and bars of wood fastened at the bottom of the ropes, which are to be taken hold of, and the pupils vault round, bearing the weight on the rope, and continually increasing in speed until they touch the ground only at intervals with their toes. (*vide cut at the commencement of Gymnastic Exercises.*)



GYMNASTICS.

66



GYMNASTIC RECREATIONS.

THE following Recreations of skill and agility, will, we have no doubt, prove highly attractive to our youthful readers; they are, with two or three exceptions, entirely distinct from the usual Gymnastic Exercises; and will be found, on account of their being less formal, more amusing, perhaps, than the preceding ones.

STEPPING THROUGH YOUR OWN FINGERS.

Get a bit of wood, or half of a tobacco-pipe, hold it between the two fore-fingers of each hand, and, without letting it go, after a little practice, you may leap over it, forward and backward, without difficulty: when perfect in this, you may, as the writer of this has frequently done, place the tops of the two middle fingers together, and leap over them both ways, without either separating or touching them with the feet. It is impossible to perform this trick with high-heeled shoes; and, in fact, the great difficulty consists in clearing the heels.

THE TRIUMPH.

THE JAVELIN.

This is a capital Gymnastic Recreation. Get a heavy pole, shod at one end with iron, or a spike, if you think proper; elevate it with the other hand to the height of the ear, and cast it at a target. At some of the Gymnastic schools, the pupils are taught to cast the pole with their fingers, as they would a reed; this is a bad practice,—the spear should be grasped with the whole hand, the but-end of it coming out between the fore-finger and thumb, and the front or shod part projecting from the little finger, which ought to encircle it as much as its thickness will permit; poise it accurately, and take your aim deliberately before you cast it. When you cast, throw your arm back as far as possible, and deliver the pole with all your force.



DOT AND CARRY TWO.

The person who is to perform this exploit, (whom we shall designate as No. 1,) stands between two others, (whom we shall call Nos. 2 and 3;) he then stoops down and passes his right hand behind the left thigh of No. 2, whose hand he grasps; and his left hand behind the right thigh of No. 3, whose left hand he grasps. Nos. 2 and 3 then pass each one arm round the neck and shoulders of No. 1, and when in this position, No. 1, by raising himself gradually from his stooping position, lifts the others from the ground.

PROSTRATE AND PERPENDICULAR.

Hold your arms on your breast, lie on your back and get up again, without making use of either your elbows or hands.

THE FLYING BOOK.

Place a book, or other convenient thing, between the two feet, in such a way that it is held between the ankles and the inner side of the feet; then kick up, backwards, with both feet, and throw the book over your head.

KNUCKLE DOWN,

An exercise of some difficulty, is performed by putting the toes against a chalk line, kneeling down and rising up again, without any assistance of the hands or moving the toes from the chalk line.



GYMNASTICS.

67

THE LONG REACH.

A line is to be marked on the floor, to which both feet, or rather, the toes of both your feet are to be brought, and beyond which they must not pass.



One hand, either right or left, at option, is then to be thrown forward (without touching the floor in its passage) so far and no farther than you can spring back again from the horizontal position to the original upright position of the body, without disturbing the stance.

posture of the feet, or scraping the floor with the hand in the back-spring. The distance, at which different persons can thus spring back from the hand, will, of course, differ according to their length of arm, or their strength and activity.

When you have ascertained the distance at which you can recover without scraping the hand, or changing the original position of your feet, you must stretch forward as far as possible; and whilst your body is supported by the hand on the floor, chalk as far as possible with the other; after this, rise up from your hand and recover your original position, without touching the ground again with either hand. There is great scope for skill and activity in this feat, and there are persons not exceeding five feet, or five feet and a few inches, who will chalk considerably further than others six feet high. The great art is, to bring your body as near to the floor as possible; for which purpose, it is recommended, (and allowable,) to move the feet backward from the line of demarcation, as far as you can, which will bring the body much lower than it is in the figure, and enable you to chalk, at ease, the full length of yourself, which is considered pretty good chalking, although there are persons who will exceed the distance very considerably. Those who perform this trick the best contrive, when on the stretch, that the body may rest upon the elbow.

CHAIRING THE LEG.

Place the left foot on the lower back rail of a chair, then pass your right

THE TURN-OVER.

In performing this feat, it is necessary to take a run of half-a-dozen paces. The trick is to place the toe of the right foot against the wall, about the height of the knee from the ground, and to throw the left leg over it, making an entire revolution, so that when your left leg reaches the ground, your back will be to the wall.



The toe of the right foot is the point upon which you must turn; and it must not quit the wall during the performance of the exploit. To perform the turn-over appears to be a matter of considerable difficulty, at the first glance of the description; but it may be attempted by a lad of tolerable activity, who has made himself master of the instructions, without

danger, and, in a short time, accomplished with facility. Ordinary care must, of course, be taken during the early attempts.

TRIAL OF THE THUMB.

This feat is very simple. Place the inside of the thumb against the edge of a table, and then move your feet backward as far as you can

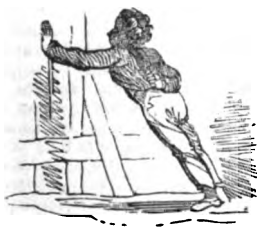


from the table, so as to be able to recover your upright position by the spring of your thumb without moving your feet. You may accomplish this feat with much greater ease, if, previously to springing from the thumb, you make two or three bends to and fro with your body. Neither the fingers, nor any part of the hand, except the thumb, should touch the table. It is advisable to begin by making the



THE PALM-SPRING.

A feat, which affords excellent exercise, something similar to the Thumb-trick, is performed by standing with your face toward a wall



and throwing yourself forward, until you support yourself from falling, by the palm of one of the hands being placed, with the fingers upward, against the wall; when in this position, you must recover your former erect station by springing from your hand, without bringing your feet forward. According to the greater or less distance you stand from the wall, the more or less difficult the feat will be. As in the feat of the Trial of the Thumb, it is better to begin the performance of the Palm-spring at a short distance only

from the wall, at first; by practice, if you are active and resolute, you may, at last, rise with ease with your feet placed full two-thirds of your own height distant from the wall.

THE STOOPING STRETCH

This feat, in which considerable agility may be acquired by practice, is performed in the following manner: draw a line on the floor, against



which place the outer edge of the right foot; at a moderate distance behind the right heel, place the left heel against the line. Take a piece of chalk in the right hand, stoop a little forward, pass the right hand between the legs immediately under the right knee, and chalk the floor as far beyond the line as you can, so that you can re-



TUMBLE-DOWN DICK.

This feat must be performed with a long-backed chair; place the knees on the extremity of the feet of the chair, in the position indicated by the



cut, and, with your two hands, take hold about the seat rail; bring your face down to touch the back of the chair, upon which, at the extremity, or as near as you can come without falling forward, or suffering the top of the chair to touch the floor, a piece of money, or &c. is placed, which is to be removed with the mouth. Much of the management in this trick depends upon properly regulating the position of the hands, which may be shifted as you find neces-

sary, up or down the upright pieces which form the back of the chair strong, old-fashioned kitchen chair is the best for this purpose.

THE FINGER-FEAT.

Your arms must be horizontally placed across the breast, and close to it; the fore-fingers of each hand must then be brought into contact. In this position another person must endeavour to separate your fingers by pulling at each arm. However much stronger he may be than you, he will not be able to detach your fingers, if you hold them properly. It must be agreed, previously, that the person who attempts to separate the fingers of the other shall not use a sudden jerk, but a regular force

TWO TO ONE.

With the skipping-rope several excellent exercises may be performed; the best, perhaps, is the following. Skip in the common way for a few seconds, constantly increasing your velocity of movement, and, at length, leap tolerably high, and whirl the rope round so fast that it may pass twice under your feet before they touch the ground; continue this until you can repeat it several times in succession, and, at last, pass the rope three times, instead of twice, under your feet during the leap.

LIFTING AT ARM'S LENGTH.

Elevating a pole at arm's length has long been accounted a superior feat; to do this, the arm must be stretched out at full length, the pole (the poker will do to begin with) grasped with the nails upward, and elevated as a right line with the arm.



GYMNASTICS

71

LEAP BEFORE YOU LOOK.

Much care must be taken in this, as well as in "The Tumb.e-down Dick" feat, lest you hurt yourself. Procure a chair that is strong, and, at



the same time, so narrow in the back that you can bestride it with ease; stand on the seat, push with your hands against the top rail, and your knees against the middle one, until you get it tilted on its back legs; but before you lose your footing, leap from the seat, so as to alight on the ground, still holding the top rail in your hand, and the back of the chair between your legs. We repeat that great caution is necessary at first, but after a little practice, the feat is very easy. Without confidence in your own powers, it can never be performed;

to give you this necessary confidence, be assured that hundreds have succeeded in achieving it.

THE GREAT WOODEN BALL.

Casting the wooden ball is a very good recreation. A large wooden bowler, in which several holes are bored, is used for this purpose. Place your thumb in one of these holes, and your middle, or fore-finger, in another, and cast it, under-handed, either at a mark or for a distance. The common bowl used in skittle-alley, (we do not mean those used for nine-pins,) will afford a pattern; the maker must, however, remember that its dimensions are to be decreased, it being too heavy, and the finger-holes too far apart for the use of boys. It ought to be adapted in size, to the age of those persons for whose use it is intended.

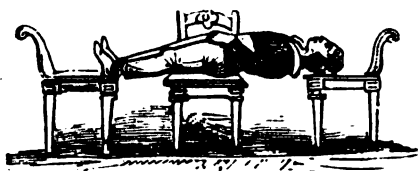
THE TANTALUS TRICK.

An amusing scene may be produced by requesting a person to stand with his back close against the wall and when in this position, placing a



TO TAKE A CHAIR FROM UNDER YOU WITHOUT FALLING.

The figure represents a youth with the back part of his head resting on one stout chair, and his heels upon another, and a third chair, which



ought to be of rather a lighter make, is placed under him. He must stiffen his body and limbs, throw up the chest, keep the shoulders down, and disengage the middle chair, which he must carry round over his

body until he deposit it again under him on the opposite side. This is another of those feats which seem very difficult, but which are, in fact, easy of execution. Be assured that if you do not succeed in it, provided the middle chair be not too heavy for your strength, it is because you have not sufficiently attended to the instructions.

THE POKER PUZZLE.



This feat is to be performed with a common fire poker, which you must hold near the top, between the fingers and thumb, as shown in the annexed cut. You must then, by the mere motion of the fingers and thumb, work or screw the poker upward, until the slender part is moved up to the hand, whilst the poker remains perpendicular during the whole process. For the first few times that this is attempted to be done, considerable difficulty will be met with, as it not only requires strength in the fingers, proportionate to the weight of the poker, but also a certain knack, which is only to be acquired by practice. We have seen some persons perform the poker

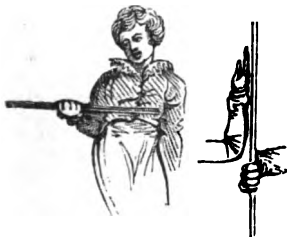


GYMNASTICS.

73

BREAST TO MOUTH.

Many persons find much difficulty in performing this feat. Measure the distance between the outside of the elbow and the extremity of the longest finger. mark that distance



on a walking-stick or ruler, as shown by Fig. 2. This stick must be held horizontally before you, as in the annexed sketch, Fig. 1; the middle finger being placed exactly over the mark; the fingers must be kept at right angles with the stick, and the thumb placed over them, as shown by the fist grasping the stick. (Fig. 2.) Holding the stick in this position you must, without changing the place of your fingers, lowering your head, or re-

moving your elbow from your side, endeavour to raise the left end of the stick from your breast to your mouth

THE CATCH-PENNY.

This is a trick with which many of our young friends are, doubtless, well acquainted; there are others of them who never heard of it, and we therefore give a sufficiently minute description of the manner of doing it, for the benefit of those who are in the latter case.



Place two, three, or even four penny pieces, in a heap, on your elbow, as in cut; drop your elbow suddenly, and bring your hand to a little below where your elbow was, and you may catch them all. It is impossible, however, to accomplish this, unless you bring your hand exactly beneath the



boy is, the longer it is necessary to have his stilts. By means of these odd additions to the natural leg, the feet are kept out of the water, which lies deep during winter on the sands, and from the heated sand during the summer; in addition to which, the sphere of vision over so perfect a flat is materially increased by the elevation, and the shepherd can see his sheep much further on stilts than he could from the ground. Stilts are easily constructed: two poles are procured, and at some distance from their ends, a loop of leather or rope is securely fastened; in these the feet are placed, the poles are kept in a proper position by the hands, and put forward by the action of the legs. A superior mode of making stilts is by substituting a piece of wood, flat on the upper surface, for the leather loop; the foot rests on and is fastened by a strap to it; a piece of leather or rope is also nailed to the stilt, and passed round the leg just below the knee; stilts made in this manner do not reach to the hands, but are managed entirely by the feet and legs. In many parts of England, boys and youth frequently amuse themselves by

Walking on Stilts.





SWIMMING.

Swimming has now become an art, and certain rules may be given for its attainment, by the aid of which, and a little practice, the most timid may eventually acquire the delightful power of "floating in the silver flood."



ferred, that every inhabitant of our island felt almost as much at ease in the water as on dry ground. The upsetting of the slender boats of the natives of Otaheite, is to them a subject of merriment; they swim about, take hold of the light vessel, right her again, and paddle away, never considering they have been in any danger. Were the practice of swimming universal in this country, and it might be so, we should hardly ever read of deaths by drowning." It would be useless to enlarge further upon the advantages to be derived from acquiring this art; they must be evident to the most inexperienced.

Before we proceed to those rules by which our youthful readers may be enabled to attain proficiency, we conceive that we shall be conferring a benefit on them by offering to their notice some extracts from Doctor Buchan's remarks, and the excellent advice of the celebrated philosopher, Doctor Franklin, on this subject.

DOCTOR BUCHAN'S REMARKS.

"Immersion in cold water is a custom which lays claim to the most remote antiquity; indeed, it must be coeval with man himself. The necessity of water for the purpose of cleanliness, and the pleasure arising from its application to the body in hot countries, must have very early recommended it to the human species. Even the example of other animals was sufficient to give the hint to man; by instinct many of them are led to apply cold water in this manner; and some, when deprived of its use, have been known to languish, and even to die.

"The cold bath recommends itself in a variety of cases, and is peculiarly beneficial to the inhabitants of populous cities, who indulge in idleness, and lead sedentary lives. It accelerates the motion of the blood, promotes the different secretions, and gives permanent vigor to the solids. But all these important purposes will be more essentially answered by the application of salt water. This ought not only to be preferred on account of its superior gravity, but likewise for its greater power of stimulating the skin, which promotes the perspiration, and prevents the patient from catching cold.

"It is necessary, however, to observe, that cold bathing is more likely to prevent than to remove obstructions of the glandular or lymphatic system; indeed, when these have arrived at a certain height, they are not to be removed by any means. In this case, the cold bath will only aggravate the symptoms, and hurry the unhappy patient into an untimely grave; it is therefore, of the utmost importance, previously to the patient's entering upon the use of the cold bath, to determine whether or not he labors under any obstinate obstruction of the lungs or other viscera: and, where this is the case, cold bathing ought strictly to be prohibited.



"In what is called a plethoric state, or too great fulness of the body, it is likewise dangerous to use the cold bath, without due preparation. In this case, there is great danger of bursting a blood-vessel, or occasioning an inflammation.

"The ancient Greeks and Romans, we are told, when covered with sweat and dust, used to plunge into rivers without receiving the smallest injury. Though they might escape danger from this imprudent conduct, yet it was certainly contrary to sound reason. Many robust men have thrown away their lives by such an attempt. We would not, however, advise patients to go in the cold water when the body is chilled; as much exercise, at least, ought to be taken, as may excite a gentle glow all over the body, but by no means so as to overheat it.

"To young people, and particularly to children, cold bathing is of the utmost importance; it promotes their growth, increases their strength, and prevents a variety of diseases incidental to childhood.

"It is, however, necessary here, to caution young men against too frequent bathing; as many fatal consequences have resulted from the daily practice of plunging into rivers, and continuing there too long.

"The most proper time of the day for using the cold bath, is, no doubt, the morning, or, at least, before dinner; and the best mode, that of quick immersion. As cold bathing has a constant tendency to propel the blood, and other humors, towards the head, it ought to be a rule always to rest that part as soon as possible. By due attention to this circumstance, there is reason to believe, that violent headaches, and other complaints which frequently proceed from cold bathing, might be often prevented.

"The cold bath, when too long continued in, not only occasions an excessive flux of humors toward the head, but chills the blood, cramps the muscles, relaxes the nerves, and wholly defeats the intention of bathing. Hence, by not adverting to this circumstance, expert swimmers are often injured, and sometimes, even lose their lives. All the beneficial purposes of cold bathing are answered by one immersion at a time; and the patient ought to be rubbed dry the moment he comes out of the water, and should continue to take exercise for sometime after."

DOCTOR FRANKLIN'S ADVICE TO SWIMMERS.

"The only obstacle to improvement, in this necessary and life-preserving art, is fear; and it is only by overcoming this timidity, that you can expect to become a master of the following acquirements. It is very common for novices in the art of swimming to make use of corks or bladders to assist in keeping the body above water; some have utterly condemned the use of them; however, they may be of service for supporting the body, while one is learning what is called the stroke, or that manner of drawing in and striking out the hands and feet, that is necessary to produce progressive motion



But you will be no swimmer till you can place confidence in the power of the water to support you ; I would, therefore, advise the acquiring that confidence in the first place ; especially as I have known several, who, by a little practice necessary for that purpose, have insensibly acquired the stroke, taught as if it were by nature. The practice I mean is this : choosing a place where the water deepens gradually, walk coolly into it till it is up to your breast ; then turn round your face to the shore, and throw an egg into the water between you and the shore ; it will sink to the bottom, and be easily seen there if the water be clean. It must lie in the water so deep that you cannot reach to take it up but by diving for it. To encourage yourself, in order to do this, reflect that your progress will be from deep to shallow water, and that at any time you may, by bringing your legs under you, and standing on the bottom, raise your head far above the water ; then plunge under it with your eyes open, which must be kept open before going under, as you cannot open the eyelids for the weight of water above you ; throwing yourself toward the egg, and endeavouring, by the action of your hands and feet against the water, to get forward, till within reach of it. In this attempt you will find that the water buoys you up against your inclination ; that it is not so easy to sink as you imagine, and that you cannot, but by active force get down to the egg. Thus you feel the power of water to support you, and learn to confide in that power, while your endeavours to overcome it, and reach the egg, teach you the manner of acting on the water with your feet and hands, which action is afterward used in swimming to support your head higher above the water, or to go forward through it.

"I would the more earnestly press you to the trial of this method, because, though I think I shall satisfy you that your body is lighter than water, and that you might float in it a long time with your mouth free for breathing, if you would put yourself into a proper posture, and would be still, and forbear struggling ; yet, till you have obtained this experimental confidence in the water, I cannot depend upon your having the necessary presence of mind to recollect the posture and the directions I gave you relating to it. The surprise may put all out of your mind.

"Though the legs, arms, and head of a human body being solid parts, are, specifically, somewhat heavier than fresh water, yet the trunk, particularly the upper part, for its hollowness, is so much lighter than water, as that the whole of the body, taken altogether, is too light to sink wholly under water, but some part will remain above, until the lungs become filled with water, which happens from drawing water to them instead of air, when a person, in the fright, attempts breathing, while the mouth and nostrils are under water.

"The legs and arms are specifically lighter than salt water, and will be supported by it, so that a human body cannot sink in salt water, though the lungs were filled as above, but from the greater specific gravity of the head



Therefore, a person throwing himself on his back in salt water, and extending his arms, may easily lay so as to keep his mouth and nostrils free for breathing; and, by a small motion of his hand, may prevent turning, if he should perceive any tendency to it.

"In fresh water, if a man throw himself on his back, near the surface, he cannot long continue in that situation but by proper action of his hands on the water; if he use no such action, the legs and lower part of the body will gradually sink till he come into an upright position, in which he will continue suspended, the hollow of his breast keeping the head uppermost.

"But if, in this erect position, the head be kept upright above the shoulders, as when we stand on the ground, the immersion will, by the weight of that part of the head that is out of the water, reach above the mouth and nostrils, perhaps a little above the eyes, so that a man cannot long remain suspended in water, with his head in that position.

"The body continuing suspended as before, and upright, if the head be leaned quite back, so that the face look upward, all the back part of the head being under water, and its weight, consequently, in a great measure supported by it, the face will remain above water quite free for breathing, will rise an inch higher every inspiration, and sink as much every expiration, but never so low as that the water may come over the mouth.

"If, therefore, a person unacquainted with swimming, and falling accidentally into the water, could have presence of mind sufficient to avoid struggling and plunging, and to let the body take this natural position, he might continue long safe from drowning, till, perhaps, help should come; for, as to the clothes, their additional weight when immersed is very inconsiderable, the water supporting it; though, when he comes out of the water, he would find them very heavy indeed.

"But, as I said before, I would not advise you, or any one, to depend on having this presence of mind on such an occasion, but learn fairly to swim, as I wish all men were taught to do in their youth; they would, on many occasions, be the safer for having that skill; and, on many more, the happier, as free from painful apprehensions of danger, to say nothing of the enjoyment in so delightful and wholesome an exercise. Soldiers particularly should, methinks, all be taught to swim; it might be of frequent use, either in surprising an enemy or saving themselves; and if I had now boys to educate, I should prefer those schools (other things being equal) where an opportunity was afforded for acquiring so advantageous an art, which, once learned, is never forgotten.

"I know by experience, that it is a great comfort to a swimmer, who has a considerable distance to go, to turn himself sometimes on his back, and so vary, in other respects, the means of procuring a progressive motion.

"When he is seized with the cramp in the leg, the method of driving



away is, to give the parts affected a sudden, vigorous, and violent shock, which he may do in the air as he swims on his back.

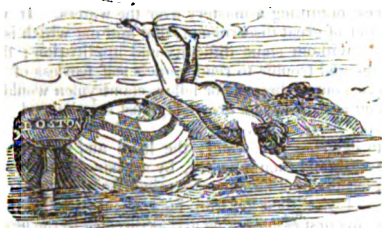
"During the great heats in summer there is no danger in bathing, however warm we may be, in rivers which have been thoroughly warmed by the sun. But to throw one's self into cold spring water, when the body has been heated by exercise in the sun, is an imprudence which may prove fatal. I once knew an instance of four young men, who, having worked at harvest in the heat of the day, with a view of refreshing themselves, plunged into a spring of cold water; two died upon the spot, a third next morning, and the fourth recovered with great difficulty. A copious draught of cold water, in similar circumstances, is frequently attended with the same effect, in North America.

"The exercise of swimming is one of the most healthy and agreeable in the world. After having swum for an hour or two in the evening, one sleeps coolly the whole night, even during the most ardent heats of summer. Perhaps the pores being cleansed, the insensible perspiration increases and occasions this coolness. It is certain that much swimming is the means of stopping a diarrhoea, and even of producing a constipation. With respect to those who do not know how to swim, or who are affected with a diarrhoea at a season which does not permit them to use that exercise, a warm bath, by cleansing and purifying the skin, is found very salutary, and often effects a radical cure. I speak from my own experience, frequently repeated, and that of others to whom I have recommended this.

"When I was a boy, I amused myself one day with flying a paper kite, and approaching the banks of a lake, which was near a mile broad, I tied the string to a stake, and the kite ascended to a very considerable height above the pond, while I was swimming. In a little time, being desirous of amusing myself with my kite, and enjoying at the same time the pleasure of swimming, I returned, and loosing from the stake the string with the little stick which was fastened to it, went again into the water, where I found that, lying on my back, and holding the stick in my hand, I was drawn along the surface of the water in a very agreeable manner. Having then engaged another boy to carry my clothes round the pond, to a place which I pointed out to him, on the other side, I began to cross the pond with my kite, which carried me quite over without the least fatigue, and with the greatest pleasure imaginable. I was only obliged occasionally to halt a little in my course, and resist its progress, when it appeared that, by following too quick, I lowered the kite too much; by doing which occasionally I made it rise again. I have never since that time practised this singular mode of swimming, though I think it not impossible to cross, in this manner, from Dover to Calais. The packet-boat, however, is still preferable."



SWIMMING.



PRACTICAL INSTRUCTIONS.

We will now suppose one of our young friends by the side of a stream, and anxious to take his first lesson in the art of swimming. If he have any friend or companion with him, who is at once competent and willing to give him the necessary directions, he will do well to follow them ; as example in this, and similar cases, is much better than precept. But if he should not be so fortunate, he can either adopt the excellent method mentioned by Doctor Franklin, as stated in a preceding page, or follow the instructions which we are about to give him on the subject.

ENTERING THE WATER.

Our young pupil must not, at first, venture into the water in the bold and dashing manner of experienced swimmers. He must wait patiently until he can do so without danger. Let him remember that there has been a time when the best swimmer alive, tottered, step by step, into the water, and sounded the depth with one foot before he lifted the other from the bottom of the stream. Leander himself, with whose history and fate our juvenile



remember that he is gradually acquiring a new and most important power ; an is, by degrees, obtaining a mastery over the waters. It was well observed by a writer of great discernment, that nothing which is worth learning is compassed without some difficulty and application ; that it is well worth some pains and trouble to render one's self fearless of falling into a river, in which two out of three of our fellow-countrymen would, in a similar situation, without assistance, be drowned, must be admitted ;—let not that trouble, therefore, be grudged.

Previously to entering the water, the head and neck should be well wetted ; the pupil should then advance, by a clear shelving bank, to some stream, the depth of which he has ascertained by plumbing or otherwise, until he is breast high ; then let him face about toward the bank, and prepare to make his first essay in this art, as directed in the next paragraph.

STRIKING OUT.

With his face turned toward the bank, as above directed, let the pupil lie down gently on his breast, keep his head and neck upright, his breast



advanced, and his back bent inward. Then, let him with draw his legs from the bottom, and immediately strike them out, not downward, but behind him ; strike out the arms forward, with the palms closed, and the backs uppermost, a little below the surface of the

water ; draw them back again, while he is gathering up his legs for a second attempt, and thus push forward, making use of his hands and feet alternately. It will, perhaps, happen, that he will swallow water in his first efforts, but this should not discourage him : neither should he fancy that, because he makes but little advances, he is not as capable of learning to swim as others ; the same little mishaps occur to all young beginners.

CORKS AND BLADDERS.

The use of corks and bladders, for those who are learning to swim, is as strongly recommended by some persons, as it is deprecated by others. That the necessary action with the arms and legs may be acquired more easily with than without them, is clear enough ; nevertheless, we are con-



SWIMMING.

85

taught by experience, that it is better to learn how to keep one's self afloat and to be able to swim ten or a dozen yards, at least, no matter how clumsily, without them. We have seen several young persons who, after having attained the necessary action, in a very superior manner, by the use of corks or bladders, were totally unable to keep their heads above the water when they relinquished their aid, and were thus left precisely in the same situation in which they would have been, had they not made a single attempt in the art of swimming. We have, it is true, known some trifling exceptions, but they have been rare indeed. Corks and bladders, we think, may be useful, but they should not be commenced with. After the learner has made some progress, and is able to cross a narrow stream, corks and bladders may be occasionally adopted, for a short time, in order that the pupil, by means of their support, may, at his ease, perfect himself in the action necessary for superior swimming, especially with the arms and hands. The action of the legs may be much better acquired by means of the plank, as hereafter directed. The best swimmers we have ever met never made use of corks for this purpose, but still they may be

considered of advantage in the manner we have stated. If therefore, our reader should think fit to use corks or bladders, let him attend to the following hints.

Swimming corks are made thus: three or four round slices of cork, increasing

progressively in circumference, are run, by a hole made in their centres, on each end of a piece of stout rope, which is long enough to reach across the breast, and beyond the arm-pits; the same number of corks is placed at each side of the rope, and they are kept from slipping off by knots at the two extremities. When bladders are used, they are blown full of air, tied at the necks, and fastened by strings to the ends of the rope, instead of corks.





would advance almost as much when using corks if he kept them still as if he moved them ; nevertheless, their action may be perfected, while the body is supported by the corks, and the young swimmer may acquire that graceful, steady, and powerful manner of striking out, which he may, subsequently, by degrees, bring into practice, when he has thrown the corks aside. The writer of these pages has buffeted the billows at a mile or two from land, where the waters have been moved by, what an angler calls, a carrying breeze, with a pleasure which those, and those alone, who have revelled in the strong bosom of the sea, can imagine ; and what is more difficult, he has swum the still torpid deeps of an inland lake, in a dead calm ; and although, perhaps, not an excellent, has been a very tolerable, swimmer in his time, and this is the manner which he has always followed, and which he recommends his young friends to adopt, of striking out with the arms. The fingers are to be closed, and the thumbs kept close to the hand, which should be straightened, or rather, a little hollowed in the palm ; the hands are then to be brought together, the two thumbs touching, or palm to palm, it is little matter which, and raised just under the chin ; they are then to be struck vigorously forward, and when the arms are at their full stretch, parted, and carried slowly and regularly, a little below the surface of the water, at the full stretch of the arms, backward, as far as convenience will permit ; they should then sink toward the hips ; by a slight pressure on the water, as they descend, the body will be raised, the head may be thrown back, and the breath drawn in for the next stroke. When the hands are at, or near, the hips, they should be raised, with the thumbs or edges, but by no means the backs, upward, to the first position ; while doing this, the legs are to be drawn up as near the body as possible, and the soles of the feet struck out against the water with reasonable force, at the same moment the hands are thrust forward again. This is, in fact, the whole principle of swimming :—the arms are first thrust forward, and the body propelled by the force of the soles of the feet, striking against the water ; the air in the lungs is expired or breathed forth during this action ; the hands are then stretched out and carried round so as to lift the body (which wants no support during the time it is propelled by the legs, and the lungs are nearly full of air,) while the legs are drawn up, and the lungs filled with air for a second effort. These very simple motions will seem difficult and complicated to the young swimmer at first, but by degrees he will learn to perform them with facility. Above all things, let him endeavour to do them deliberately and without being flurried. It is a fact, that a swimmer, who is apparently slow in his action, makes more progress by half than one who is quick. The former is deliberate and vigorous ; the latter hurried, less effectual, and soon becomes fatigued. A tyro in the art will make ten efforts during the time occupied by an adept in performing one, and at the same time will scarcely make one half the progress.



SWIMMING.

85

We seriously recommend our young readers never to venture out of their depths with corks, if they cannot swim without them. We once knew a very promising youth who was nearly drowned, when in deep water, by the corks slipping from his breast to below his waist, so that his loins, and, at last, his legs, were above water, while his head was beneath; he was extricated from this perilous situation by a youth of his own age, who had begun to learn the art of swimming, but without corks, on precisely the same day as the lad who was thus in danger of being drowned. It would be well, if a string were tied by its middle to each end of the rope, close to the largest cork, and one end of it brought over the shoulder at the back, the other in front, and fastened securely together; this would, at least, prevent the corks from getting out of their proper places.

THE PLANK.

The plank is useful in a bath, to perfect the young swimmer in the manner of properly throwing out his legs and feet.



A piece of plank, about ten or twelve feet in length, two inches thick, and a foot and a half, or two feet broad, is the best size. It is to be thrown into the water, and the pupil, after he has acquired the art of supporting himself for a short time, without any artificial aids, should take hold of one

of its ends with both hands; his body will thus be supported, and he should strike out with his legs in the manner before directed, and endeavour to drive the plank before him, taking care to hold fast and follow it closely, otherwise he may suffer rather an unpleasant feeling by the plank darting forward, and leaving him to sink, unexpectedly, over head and ears in the water. Of the utility of the plank for the purpose above mentioned, we have frequently been witness, and can, therefore, most confidently recommend it to those of our young readers who have an inclination to learn the art of swimming by occasional or preliminary artificial aids.

THE ROPE, AND OTHER AIDS.

The rope for swimmers is usually fastened to the end of a stout piece of wood, which is fixed into a wall or elsewhere, so as to project over the water; the rope descends to its surface, or it may be long enough for a foot or sixteen inches of its extremity to sink. The use of the rope is to



support the learner while practising the action with the legs; but it is very inferior for this purpose to the plank; as, while the pupil keeps himself up, by holding the rope, his body remains in too perpendicular a position, so that he strikes downward rather than backward. The pupil should accustom himself, as much as possible, to keep his legs near the surface; for those who swim with the lower extremities deep in the water never make such rapid way as others who adopt the proper position, which should be within a few degrees of horizontal. The plank has another advantage over the rope; it is more steady in the water, and offers sufficient resistance to induce, and even to assist, the young beginner, as a *point d'appui*, to strike out vigorously with his legs. The rope is, in fact, of more utility to those who go into the water to bathe, than those who are learning to swim; for by means of the support which it affords, the bather may raise

his legs from the bottom, and exercise himself most beneficially by tossing, stretching, and turning to and fro in the water; he may thus luxuriate in a manner which would be entirely out of his power without the aid of the rope.

The aid of the hand is chiefly applied to very young learners, who have the advantage of bathing with a grown-up swimmer. It is by far superior as an aid, to corks or bladders; because it can be withdrawn gradually, and at last, altogether, so that the





SWIMMING.

87

was provided in his own person. He soon becomes exhausted but, from that time, he feels a confidence in himself, and his progress is generally most rapid.

The aid of the rope and hand we do not so much approve as that of the hand alone. A rope is fastened about the learner's body, a grown person holds the other end of it, and supports the pupil while he acquires the mode of striking out. The aid, in this case, cannot be applied with such precision to the proper part nor afforded and withdrawn with such nicety as where the hand alone is used.

SWIMMING OUT OF DEPTH.

We will now suppose our pupil to have made some progress in swimming, and to feel anxious to go into deep water. If he feel quite conscious of his own powers, he may venture a few strokes out of his depth, across a stream, for instance, which is overhead only for a few feet in the centre, with shelving banks on each side. Young swimmers sometimes feel alarmed when they are aware that they have ventured where they can no longer put their



legs on the ground; this feeling flurries them, they strike quick, their hurry increases, trepidation ensues, and they have great difficulty in returning to the shore. We earnestly caution our pupil against giving way to anything of this sort. Before he ventures

out of his depth, let him calculate his own powers, and attempt such a distance only as is in proportion with them. Is he able to swim half-a-dozen yards without dropping his feet to the ground? If so, he may confidently cross a deep place which is only half that breadth. Let him not imagine that he is not quite as capable of swimming in deep as in shallow water; the contrary is the fact, for the deeper the water, the better he can swim. Above all things, let him not hurry himself, but strike slowly and evenly,



which creates a very unpleasant nausea and momentary suffocation. When the hands are in the position above mentioned, the progress of the body forward ceases, the face is no longer driven against the water, but is elevated above the surface; then is the time to draw in the breath, which should be expired while the body at the next stroke is sent forward by the action of the legs. During this time, if your mouth be even with or partly under the surface, no water can enter it, the air which you are driving between your lips effectually preventing it. "Keep time," is one of the swimmer's golden rules. Unless the pupil pay attention to it, he will make but little progress, and must inevitably, now and then, take in a mouthful of the stream in which he is swimming. To those who have never swam "in the silver flood," a circumstance of this sort will be thought very lightly of indeed; but we speak the general feelings of swimmers, when we say, that the same person who would relish a draught from a stream, when sitting dressed upon its bank, would feel the greatest disgust at taking a mouthful of the same water, when swimming in it.

After the pupil has ventured out of his depth, and feels satisfied with the success of his attempt, he grows emboldened, and increases his distances daily.

TO TREAD WATER.

All that is necessary for treading water, is to let your legs drop in the water until you are upright; then keep yourself afloat in that position by treading downward with your feet, alternately; and, if necessary, paddling with your palms at your hips.

TO SWIM ON THE SIDE.

Lower your left side, and at the same time elevate your right; strike forward with your left hand, and sideways with your right; the back of the latter being in front instead of upward, the thumb side of the hand downward, so as to serve precisely as an oar. You will thus, by giving your body an additional impetus, advance much more speedily than in the common way; it will also relieve you considerably when you feel tired of striking out forward. You may also turn on the right side, strike out with the right hand, and use the left as an oar. In either case, the action of the legs is the same as usual.

TO SWIM LIKE A DOG.

Strike with each hand and foot alternately; that is, begin with the right hand and foot, draw the hand toward the chin, and the foot toward the body at the same time; and then simultaneously kick backward with the foot and strike out in a right line with the hand; then do the like with the left hand and foot, and so on. The hands are not to be carried backward as in the ordinary way of swimming, but merely thrust out with the palms down



SWIMMING.

89

ward, a little way below the surface, in front only ; as they are brought back to the breast again, they should be rather hollowed, and the water grasped or pulled toward the swimmer. Much progress cannot be made by swimming in this manner, but still it is worth learning, as every change of method in going a distance, recruits the swimmer's strength.

THE PORPOISE.

This is a very pleasant and most advantageous change of action. The right arm is lifted entirely out of the water, the shoulder thrust forward, and the swimmer, while striking out with his legs, reaches forward with his hand, as far as possible. At the utmost stretch of the arm the hand falls, a little hollowed, into the water, which it grasps or pulls toward the swimmer in its return to the body, in a transverse direction, toward the other armpit. While it is passing through the water in this manner, the legs are drawn up for another effort, and the left arm and shoulder elevated and thrust forward as above directed for the right. This is the greatest advancing relief in swimming, except swimming on the back ; floating on the back rests the whole of the body as well as the limbs, but while floating, no progress is made ; whereas, during the time a person swims in the manner above directed, he will not only relieve himself considerably, but also make as great an advance in the water, as if he were proceeding in the ordinary way.

TO SWIM AND FLOAT ON THE BACK.

To do this, you must turn yourself on your back as gently as possible, elevate your breast above the surface, put your head back, so that your eyes, nose, mouth and chin only are above water. By keeping in this position with the legs and arms extended, and paddling the hands gently by the side of the hips, you will float. If you wish to swim, you must strike out with the legs, taking care not to lift your knees too





To turn from your breast to your back, raise your legs forward, and thrust your head backward, until your body is in a right position : to change from the back to the breast, drop your legs, and throw your body forward on your breast.

TO TURN WHEN SWIMMING.

If you wish to turn while on your back, keep one leg still, and embrace the water beside you with the other ; thus, you will find yourself turn to that side on which your leg by its motion embraces the water, and you will turn either to the right or left, according to which leg you use in this manner.

To turn while swimming in the ordinary way requires no further effort than to incline your head and body to the side you would turn to ; and, at the same time, move and turn your legs, in the same manner as you would do, to turn the same way on land.

TO SHOW THE FEET.

While on your back, bend the small of it downward ; support yourself by moving your hands to and fro just above your breast, and stretch your feet above the water.

TO BEAT THE WATER, &c.

When swimming on your back, lift your legs out of the water one after another, and strike the water with them alternately. Those who are most expert at this, bring their chins toward their breasts at each stroke of the legs.

There is a variety of similar feats performed by expert swimmers, such as treading water with both hands raised over the head ; floating on the back with the arms above the surface ; taking the left leg in the right hand, out of the water, when swimming on the back ; pulling the right heel by the right hand, toward the back, when swimming in the common way ; throwing somersets in the water, backward and forward, &c. &c., for which no particular directions are necessary, as the pupil, when he has grown expert in the various modes of swimming which we have described, will be able to do these things, and any tricks which his fancy may suggest, without difficulty.

DIVING.

Diving, by practice, may be carried to astonishing perfection. Pearls are brought up from the bottom of the sea by divers who are trained to remain a considerable time under water. In ancient times, divers were employed in war to destroy the ships of the enemy ; and many instances are related, by respectable authors, of men diving after, and fetching up nails and pieces of



SWIMMING.

91

money thrown into the sea, and even overtaking the nail or coin before it has reached the bottom.

Diving may be performed from the surface of the water when swimming, by merely turning the head downward, and striking upward with the legs. It is, however, much better to leap in, with the hands closed above the head, and head foremost, from a pier, boat or raised bank. By merely striking with the feet, and keeping his head toward the bottom, the diver may drive himself a considerable distance beneath the surface. If



he reach the bottom, he has only to turn his head upward, spring from the ground with his feet, and he will soon arrive at the surface. If desirous of making a more rapid ascent, he should strike downward with his feet, pulling the water above him toward his head with one hand, and striking it downward by his side with the other. In diving, the eyes should be open; you must, therefore, take care that you do not close them, as they reach the surface, when you commence your descent. It is almost needless to add, that the breath should be held, the whole time that you are under water.

SWIMMING UNDER WATER.

Swimming between top and bottom may be accomplished by the ordinary stroke, if you take care to keep your head a little downward, and strike a little higher with your feet than when swimming on the surface; or, you may turn your thumbs downward, and perform the stroke with the hands in that position, instead of keeping them flat.

THE CRAMP.

Our practical directions in the art of swimming would be incomplete were we to omit saying a few words as to the cramp. Those who are at



tion, the sufferer has saved himself by acting as we are about to advise our young reader, if ever he should be seized with this terrible contraction. Be assured that there is no danger, if you are only a tolerable swimmer and do not flurry yourself. The moment you feel the cramp in your leg or foot, strike out the limb with all your strength, thrusting the heel out, and drawing the toes upward as forcibly as possible, totally regardless of the momentary pain it may occasion. If two or three efforts of this nature do not succeed, throw yourself on your back, and endeavour to keep yourself afloat with your hands until assistance reach you; or, if there be no hope of that, try to paddle ashore with your palms. Should you be unable to float on your back, put yourself in the position directed for treading water, and you may keep your head above the surface by merely striking the water downward with your hands at your hips, without any assistance from your legs. In case you have the cramp in both legs, you may also endeavour to make some progress in this manner, should no help be at hand. If you have one leg only attacked, you may drive yourself forward with the other. In order to endow you with confidence in a moment of danger from an attack of the cramp, occasionally try to swim with one leg, or a leg and a hand, or the two hands only, and you will find that it is by no means difficult.

We feel rather astonished that none of the treatises on swimming, which have fallen into our hands, recommend the practice of boys attempt-



ing to carry one another in the water; when both can swim, this is an excellent and safe method of learning how to support another who is in danger on account of cramp weakness, ignorance of swimming, or other causes. In the annexed sketch, the foremost figure is in the act of swimming, and carrying with him another person, who is borne up, simply by applying one hand to



SWIMMING.

93

what ease he can support a person attached to him in this manner. The person, who rests upon the hips of his companion, is represented as passive, as he is supposed to be unable to swim; but two swimmers, performing this experiment, may strike out together with their legs.

TIMES AND PLACES FOR SWIMMING.

Of all places to swim in, the sea is best, running waters next, and ponds the worst. The best time for swimming is in the months of May, June, July, and August. There are, however, some years, wherein it is not healthy to go into the water during these months; as when the weather, and consequently the water, is colder than ordinary for the season. One ought not to go into the water when it rains; for the rain, if it last any time, chills the water, and endangers catching cold, by wetting one's clothes. The night is also improper for this exercise. Beware of weeds, as although you have company with you, yet, you may be lost beyond the possibility of help, if your feet get entangled among them. The bottom ought to be of gravel, or smooth stones, so that you may stand thereon as firmly as on the earth, and be neither in danger of sinking in the mud, nor wounding the feet: care ought also to be taken that it be even, and without holes; and, above all, that you know the depth, especially when you begin to learn; for as it is then easy to tire one's self when struggling and making the first efforts, you should, therefore, be sure that the bottom is not out of your depth, when you have occasion to rest, and take breath. It is impossible to be too cautious when you are alone, or have no one in company that knows the pond or stream. When you have found out a place fit to learn in, do not venture any where else till you are considerably advanced in the art; and, till then, it will be the best way to exercise with some one who is already expert in swimming.

CONCLUDING REMARKS.

In entering the water, the head should be wetted first, either by plunging in head foremost, or pouring water on it. Before you adopt the first method.



If one of your companions be in danger of drowning, be sure that, in endeavouring to save him, you make your approaches in such a manner, as will prevent him from grappling with you; if he once get a hold of your limbs, you both will almost inevitably be lost.

Although it has been said, that the weight of one's clothes will make but a little difference in the water, yet we strongly advise the young swimmer when he has become expert in the art, and confident of his own powers, to swim occasionally with his clothes on; for this purpose, of course he need only use an old worn-out suit: by so doing, he will be satisfied that dress does not make so much difference as he might imagine, and thus he will have more courage and presence of mind if he should at any time afterward fall into the water, or leap in to save another.



**"This is the purest exercise of health,
The kind refresher of the summer heats."**

THOMSON







ARITHMETICAL AMUSEMENTS



Cocker and Dilworth, Walsingame and Vyse,
 In their own sphere, by BIDDER were outshone:
 They, or with pen or pencil, problems solved,—
 He, with no aid but wond'rous memory;
 They, when of years mature, acquired their fame,—
 He, "lisp'd in numbers, for the numbers came."

THE delightful and valuable science of Arithmetic first arrived at any degree of perfection in Europe, among the Greeks, who made use of the letters of the alphabet to express their numbers. A similar mode was followed by the Romans, who, besides characters for each rank of thous-



natives of Peru, in South America, who do all by the arrangement of grains of maize, excel the European, with the aid of all his rules and implements for writing. But the dexterity of those people cannot for a moment be compared with the feats of mental arithmetic exhibited by **GEORGE BINDER**, the youth, whose portrait stands at the head of this article. This astonishing boy, at a very early age, and without education, was capable of solving very intricate questions in arithmetic, without the use of pen, pencil, or writing implements of any sort, but entirely in his own mind, as correctly and as quickly as the most expert person could in the common way. We have, personally, witnessed his ability in this respect, and among many other complicated questions, which were put to him, we recollect the following:—Supposing the sun to be 95 millions of miles from the earth, and that it were possible for an insect, whose pace should be $7\frac{1}{2}$ inches per minute, to travel that pace how long would it take to reach the sun? This he mentally solved in a very short time.

Several other mental arithmeticians have appeared within these few years; among the rest, **JEDIDIAH BUXTON**, an illiterate peasant, who was never taught to read or write, appears to have been eminent. Several of the questions answered by this man have been recorded; among others, we recollect the following:—How many times will a coach-wheel, whose circumference is 6 yards, turn in going 204 miles? In thirteen minutes, **BUXTON** answered,—59,840 times. Then he was asked:—And, supposing sound travels at the rate of 1142 feet per second, how long will it be before the report of a cannon is heard 5 miles off? His answer was,—23 seconds, 7 thirds, and 46 remain. On being required to multiply 456 by 378, he gave the product in a very short time; and, when requested to work the question verbally, so that his method might be known, he multiplied 456 first by 5, which produced 2280; this he again multiplied by 20, and found the product 45,600, which was the multiplicand multiplied by 100; this product he again multiplied by 3, which produced 136,800, the product of the multiplicand by 300; it remained, therefore, to multiply this by 78, which he effected by multiplying 2280, (or the product of the multiplicand multiplied by 5,) by 15, as 5 times 15 are 75. This product, being 34,200, he added to 136,800, which was the multiplicand multiplied by 300, and this produced 171,000 which was 375 times 456. To complete his operation, therefore, he multiplied 456 by 3, which produced 1368, and having added this number to 171,000, he found the product of 456 multiplied by 378, to be 172,368. By this it appears, that he was so little acquainted with the common rules, as to multiply 456 first by 5, and the product by 20, to find what sum it would produce, multiplied by 100; whereas, had he added two ciphers to the figures he would have obtained the product at once.



TO TELL ANY NUMBER THOUGHT ?

Desire any person to think of a number, say a certain number of shillings; tell him to borrow that sum of some one in the company, and add the number borrowed to the amount thought of. It will here be proper to name the person who lends him the shillings, and to beg the one who makes the calculation, to do it with great care, as he may readily fall into an error, especially the first time. Then, say to the person,—‘I do not lend you, but give you 10, add them to the former sum.’ Continue in this manner :—‘Give the half to the poor, and retain in your memory the other half.’ Then add :—‘Return to the gentleman, or lady, what you borrowed, and remember that the sum lent you, was exactly equal to the number thought of.’ Ask the person if he knows exactly what remains; he will answer ‘Yes.’ You must then say,—‘And I know also the number that remains; it is equal to what I am going to conceal in my hand.’ Put into one of your hands 5 pieces of money, and desire the person to tell how many you have got. He will answer 5; upon which, open your hand, and show him the 5 pieces. You may then say,—‘I well knew that your result was 5; but if you had thought of a very large number, for example, two or three millions, the result would have been much greater, but my hand would not have held a number of pieces equal to the remainder.’ The person then supposing that the result of the calculation must be different, according to the difference of the number thought of, will imagine that it is necessary to know the last number in order to guess the result: but this idea is false; for, in the case which we have here supposed, whatever be the number thought of, the remainder must always be 5. The reason of this is as follows :—The sum, the half of which is given to the poor, is nothing else than twice the number thought of, plus 10; and when the poor have received their part, there remains only the number thought of, plus 5; but the number thought of is cut off when the sum borrowed is returned, and, consequently, there remain only 5.

It may be hence seen, that the result may be easily known, since it will be the half of the number given in the third part of the operation; for example, whatever be the number thought of, the remainder will be 66 or 25 according as 72 or 50 have been given. If this trick be performed several times successively, the number given in the third part of the operation must be always different; for if the result were several times the same, the deception might be discovered. When the five first parts of the calculation for obtaining a result are finished, it will be best not to name it at first, but to continue the operation, to render it more complex, by saying, for example :—‘Double the remainder, deduct two, add three, take the fourth part,’ &c.; and the different steps of the calculation may be kept in



mind, in order to know how much the first result has been increased or diminished. This irregular process never fails to confound those who attempt to follow it.

A SECOND METHOD.

Bid the person take 1 from the number thought of, and then double the remainder; desire him to take 1 from this double, and to add to it the number thought of; in the last place, ask him the number arising from this addition, and, if you add 3 to it, the third of the sum will be the number thought of. The application of this rule is so easy, that it is needless to illustrate it by an example.

A THIRD METHOD.

Desire the person to add 1 to the triple of the number thought of, and to multiply the sum by 3; then bid him add to this product the number thought of, and the result will be a sum, from which if 3 be subtracted, the remainder will be ten times of the number required; and if the cipher on the right be cut off from the remainder, the other figure will indicate the number sought.

Example:—Let the number thought of be 6, the triple of which is 18; and if 1 be added, it makes 19; the triple of this last number is 57, and if 6 be added, it makes 63, from which if 3 be subtracted, the remainder will be 60: now, if the cipher on the right be cut off, the remaining figure, 6, be the number required.

A FOURTH METHOD.

Bid the person multiply the number thought of by itself; then desire him to add 1 to the number thought of, and to multiply it also by itself; in the last place, ask him to tell the difference of these two products, which will certainly be an odd number, and the least half of it will be the number required.

Let the number thought of, for example, be 10; which, multiplied by itself, gives 100; in the next place, 10 increased by 1 is 11, which, multiplied by itself, makes 121; and the difference of these two squares is 21, the least half of which, being 10, is the number thought of.

This operation might be varied by desiring the person to multiply the second number by itself, after it has been diminished by 1. In this case, the number thought of will be equal to the greater half of the difference of the two squares.

Thus, in the preceding example, the square of the number thought of is 100, and that of the same number, less 1, is 81; the difference of them is 19; the greater half of which, or 10, is the number thought of.



TO TELL TWO OR MORE NUMBERS THOUGHT OF.

If one or more of the numbers thought of be greater than 9, we must distinguish two cases ; that in which the number of the numbers thought of is odd, and that in which it is even.

In the first case, ask the sum of the first and second ; of the second and third ; the third and fourth ; and so on to the last ; and then the sum of the first and the last. Having written down all these sums in order, add together all those, the places of which are odd, as the first, the third, the fifth, &c. ; make another sum of all those, the places of which are even, as the second, the fourth, the sixth, &c. ; subtract this sum from the former, and the remainder will be the double of the first number. Let us suppose, for example, that the five following numbers are thought of, 3, 7, 13, 17, 20, which when added two and two as above, give 10, 20, 30, 37, 23 : the sum of the first, third, and fifth is 63, and that of the second and fourth is 57 ; if 57 be subtracted from 63, the remainder, 6, will be the double of the first number, 3. Now, if 3 be taken from 10, the first of the sums, the remainder, 7, will be the second number ; and by proceeding in this manner, we may find all the rest.

In the second case, that is to say, if the number of the numbers thought of be even, you must ask and write down, as above, the sum of the first and the second ; that of the second and third ; and so on, as before : but instead of the sum of the first and the last, you must take that of the second and last ; then add together those which stand in the even places, and form them into a new sum apart ; add also those in the odd places, the first excepted, and subtract this sum from the former, the remainder will be the double of the second number ; and if the second number, thus found, be subtracted from the sum of the first and second, you will have the first number ; if it be taken from that of the second and third, it will give the third ; and so of the rest. Let the numbers thought of be, for example, 3, 7, 13, 17 : the sums formed as above are 10, 20, 30, 24 ; the sum of the second and fourth is 44, from which if 30, the third, be subtracted, the remainder will be 14, the double of 7, the second number. The first, therefore, is 3, the third 13, and the fourth 17.

When each of the numbers thought of does not exceed 9, they may be



Then, ask the number arising from the addition of the last number thought of, and if there were two numbers, subtract 5 from it; if there were three, 55; if there were four, 555; and so on; for the remainder will be composed of figures, of which the first on the left will be the first number thought of, the next the second, and so on.

Suppose the number thought of to be 3, 4, 6; by adding 1 to 6, the double of the first, we shall have 7, which, being multiplied by 5, will give 35; if 4, the second number thought of, be then added, we shall have 39, which doubled, gives 78; and, if we add 1, and multiply 79, the sum, by 5, the result will be 395. In the last place, if we add 6, the number thought of, the sum will be 401; and if 55 be deducted from it, we shall have, for remainder, 346, the figures of which, 3, 4, 6, indicate in order the three numbers thought of.

THE MONEY GAME.

A person having in one hand a piece of gold, and in the other a piece of silver, you may tell in which hand he has the gold, and in which the silver, by the following method:—Some value, represented by an even number, such as 8, must be assigned to the gold, and a value represented by an odd number, such as 3, must be assigned to the silver; after which, desire the person to multiply the number in the right hand by any even number whatever, such as 2; and that in the left by an odd number, as 3; then bid him add together the two products, and if the whole sum be odd, the gold will be in the right hand, and the silver in the left; if the sum be even, the contrary will be the case.

To conceal the artifice better, it will be sufficient to ask whether the sum of the two products can be halved without a remainder; for in that case the total will be even, and in the contrary case odd.

It may be readily seen, that the pieces, instead of being in the two hands of the same person, may be supposed to be in the hands of two persons, one of whom has the even number, or piece of gold, and the other the odd number, or piece of silver. The same operations may then be performed in regard to those two persons, as are performed in regard to the two hands of the same person, calling the one privately the right and the other the left.

THE GAME OF THE RING.

This game is an application of one of the methods employed to tell several numbers thought of, and ought to be performed in a company not exceeding nine, in order that it may be less complex. Desire any one of the company to take a ring, and put it on any joint of whatever finger he may think proper. The question then is, to tell what person has the ring, and on what hand what finger, and on what joint.



For this purpose, you must call the first person 1, the second 2, the third 3, and so on. You must also denote the ten fingers of the two hands, by the following numbers of the natural progression, 1, 2, 3, 4, 5 &c. beginning at the thumb of the right hand, and ending at that of the left, that by this order of the number of the finger may, at the same time indicate the hand. In the last place, the joints must be denoted by 1, 2, 3, beginning at the points of the fingers.

To render the solution of this problem more explicit, let us suppose that the fourth person in the company has the ring on the sixth finger, that is to say, on the little finger of the left hand, and on the second joint of that finger.

Desire some one to double the number expressing the person, which, in this case, will give 8; bid him add 5 to this double, and multiply the sum by 5, which will make 65; then tell him to add to this product the number denoting the finger, that is to say, 6, by which means you will have 71; and, in the last place, desire him to multiply the last number by 10, and to add to the product the number of the joint, 2; the last result will be 712; if from this number you deduct 250, the remainder will be 462; the first figure of which, on the left, will denote the person; the next, the finger, and consequently, the hand; and the last, the joint.

It must here be observed, that when the last result contains a cipher, which would have happened in the present example, had the number of the finger been 10, you must privately subtract from the figure preceding the cipher, and assign the value of 10 to the cipher itself.

THE GAME OF THE BAG.

To let a person select several numbers out of a bag, and to tell him the number which shall exactly divide the sum of those he has chosen:—Provide a small bag, divided into two parts into one of which put several tickets, numbered 8, 9, 15, 36, 63, 120, 213, 309, &c.; and in the other part put as many other tickets, marked No. 3 only. Draw a handful of tickets from the first part, and, after showing them to the company, put them into the bag again, and, having opened it a second time, desire any one to take out as many tickets as he thinks proper; when he has done that, you



THE NUMBER NINE (See opposite page.)

$$\begin{array}{r}
 1-0-0 \\
 \hline
 3 \\
 37..2+7-0 \\
 \hline
 4 \\
 38..2+6-0 \\
 \hline
 5 \\
 47..4+5-0 \\
 \hline
 6 \\
 54..5+4-0 \\
 \hline
 7 \\
 63..6+3-0 \\
 \hline
 8 \\
 72..7+2-0 \\
 \hline
 9 \\
 81..8+1-0
 \end{array}$$



THE NUMBER NINE. (*See opposite page.*)

The following discovery of remarkable properties of the number 9 was accidentally made, more than forty years since, though, we believe, it is not generally known :—

The component figures of the product made by the multiplication of every digit into the number 9, when added together, make NINE.

The order of these component figures is reversed, after the said number has been multiplied by 5.

The component figures of the amount of the multipliers, (*viz.* 45) when added together, make NINE.

The amount of the several products, or multiples of 9, (*viz.* 405) when divided by 9, gives, for a quotient, 45; that is, $4+5=NINE$.

The amount of the first product, (*viz.* 9) when added to the other product, whose respective component figures make 9, is 81; which is the square of NINE.

The said number 81, when added to the above-mentioned amount of the several products, or multiples of 9 (*viz.* 405) makes 486; which, if divided by 9, gives, for a quotient, 54: that is, $5+4=NINE$.

It is also observable, that the number of changes that may be rung on nine bells, is 362,880; which figures, added together, make 27; that is, $2+7=NINE$.

And the quotient of 362,880, divided by 9, will be 40,320; that is $4+0+3+2+0=NINE$.

To add a figure to any given number, which shall render it divisible by Nine :—Add the figures together in your mind, which compose the number named; and the figure which must be added to the sum produced, in order to render it divisible by 9, is the one required. Thus—

Suppose the given number to be 7521 :—

Add those together, and 15 will be produced; now 15 requires 3 to render it divisible by 9; and that number, 3, being added to 7521, causes the same divisibility :—

$$\begin{array}{r} 7521 \\ 3 \\ \hline 9)7524(836 \end{array}$$



THE CERTAIN GAME.

Two persons agree to take, alternately, numbers less than a given number, for example, 11, and to add them together till one of them has reached a certain sum, such as 100. By what means can one of them infallibly attain to that number before the other?

The whole artifice in this, consists in immediately making choice of the numbers, 1, 12, 23, 34, and so on, or of a series which continually increases by 11, up to 100. Let us suppose, that the first person, who knows the game, makes choice of 1; it is evident that his adversary, as he must count less than 11, can, at most, reach 11, by adding 10 to it. The first will then take 1, which will make 12; and whatever number the second may add, the first will certainly win, provided he continually add the number which forms the complement of that of his adversary, to 11; that is to say, if the latter take 8, he must take 3; if 9, he must take 2; and so on. By following this method, he will infallibly attain to 89; and it will then be impossible for the second to prevent him from getting first to 100; for whatever number the second takes, he can attain only to 99; after which the first may say—"and 1 makes 100." If the second take 1 after 89, it would make 90, and his adversary would finish by saying—"and 10 make 100." Between two persons who are equally acquainted with the game, he who begins must necessarily win.

MAGICAL CENTURY.

If the number 11 be multiplied by any one of the nine digits, the two figures of the product will always be alike, as appears in the following example:—

11	11	11	11	11	11	11	11	11
1	2	3	4	5	6	7	8	9
—	—	—	—	—	—	—	—	—
11	22	33	44	55	66	77	88	99
—	—	—	—	—	—	—	—	—

Now, if another person and yourself have fifty counters apiece, and agree never to stake more than ten at a time, you may tell him, that if he permit you to stake first, you will always complete the even century



ARITHMETICAL AMUSEMENTS.

105

If your opponent have no knowledge of numbers, you may stake any other number first, under 10, provided you subsequently take care to secure one of the last terms, 56, 67, 78, &c. ; or you may even let him stake first, if you take care afterward to secure one of these numbers.

This exercise may be performed with other numbers; but, in order to succeed, you must divide the number to be attained, by a number which is a unit greater than what you can stake each time; and the remainder will then be the number you must first stake. Suppose, for example, the number to be attained be 52, (making use of a pack of cards instead of counters,) and that you are never to add more than 6; then, dividing 52 by 7, the remainder, which is 3, will be the number which you must first stake; and whatever your opponent stakes, you must add as much to it as will make it equal to 7, the number by which you divided, and so in continuation.

THE CANCELLED FIGURE GUESSED.

To tell the figure a person has struck out of the sum of two given numbers:—Arbitrarily command those numbers only, that are divisible by 9; such, for instance, as 36, 63, 81, 117, 126, 162, 261, 360, 315, and 432.

Then let a person choose any two of these numbers; and, after adding them together in his mind, strike out from the sum any one of the figures he pleases.

After he has so done, desire him to tell you the sum of the remaining figures; and it follows, that the number which you are obliged to add to this amount, in order to make it 9 or 18, is the one he struck out. Thus:—

Suppose he chooses the numbers 162 and 261, making altogether 423, and that he strike out the centre figure, the two other figures will, added together, make 7, which, to make 9, requires 2, the number struck out.

THE DICE GUESSED UNSEEN.

A pair of dice being thrown, to find the number of points on each die without seeing them:—Tell the person, who cast the dice, to double the



there be added 5, and the sum produced, 9, be multiplied by 5, the product will be 45; to which, if 3, the number of points on the other die, be added, 48 will be produced, from which, if 25 be subtracted, 23 will remain; the first figure of which is 2, the number of points on the first die, and the second figure 3, the number on the other.

THE SOVEREIGN AND THE SAGE

A sovereign being desirous to confer a liberal reward on one of his courtiers, who had performed some very important service, desired him to ask whatever he thought proper, assuring him it should be granted. The courtier, who was well acquainted with the science of numbers, only requested that the monarch would give him a quantity of wheat equal to that which would arise from one grain doubled sixty-three times successively. The value of the reward was immense; for it will be found, by calculation, that the sixty-fourth term of the double progression divided by $1:2:4:8:16:32:\&c.$, is 9223372036854775808. But the sum of all the terms of a double progression, beginning with 1, may be obtained by doubling the last term, and subtracting from it 1. The number of the grains of wheat, therefore, in the present case, will be 18446744073709551615. Now, if a pint contain 9216 grains of wheat, a gallon will contain 73728; and, as eight gallons make one bushel, if we divide the above result by eight times 73728, we shall have 31274997411295 for the number of the bushels of wheat equal to the above number of grains: a quantity greater than what the whole surface of the earth could produce in several years, and which, in value, would exceed all the riches, perhaps, on the globe.

THE HORSE-DEALER'S BARGAIN.

A gentleman, taking a fancy to a horse, which a horse-dealer wished to dispose of at as high a price as he could; the latter, to induce the gentleman to become a purchaser, offered to let him have the horse for the value of the twenty-fourth nail in his shoes, reckoning one farthing for the first nail, two for the second, four for the third, and so on to the twenty-fourth. The gentleman, thinking he should have a good bargain, accepted the offer; the price of the horse was, therefore, necessarily great.

By calculating as before, the twenty-fourth term of the progression $1:2:4:8:\&c.$, will be found to be 8388608, equal to the number of farthings the purchaser gave for the horse; the price, therefore, amounted to £8738. 2s. 8d.

THE DINNER PARTY.

A club of seven persons agreed to dine together every day successively as long as they could sit down to table differently arranged. How many



ARITHMETICAL AMUSEMENTS.

107

amusements would be necessary for that purpose? It may be easily found, by the rules already given, that the club must dine together 5040 times, before they would exhaust all the arrangements possible, which would require above thirteen years.

COMBINATIONS OF AN ANAGRAM.

If any word be proposed, for instance, AMOR, and it be required to show how many different words could be formed of these four letters, which will give all the possible anagrams of that word, we shall find by multiplying together 1, 2, 3, and 4, that they are in number, 24, as represented in the following table:—

AMOR	MORA	ORAM	RAMO
AMRO	MOAR	ORMA	RAOM
AOMR	MROA	OARM	RMAO
AORM	MRAO	OAMR	RMOA
ARMO	MAOR	OMRA	ROAM
AROM	MARO	OMAR	ROMA

THE BASKET AND THE STONES.

If a hundred stones be placed in a straight line, at the distance of a yard from each other, the first being at the same distance from a basket, how many yards must the person walk who engages to pick them up, one by one, and put them into the basket? It is evident that, to pick up the first stone, and put it into the basket, the person must walk two yards; for the second, he must walk four; for the third, six; and so on, increasing by two, to the hundredth.

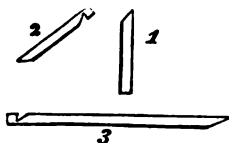
The number of yards, therefore, which the person must walk, will be equal to the sum of the progression, 2, 4, 6, &c. the last term of which is 200, (22.) But the sum of the progression is equal to 202, the sum of the two extremes, multiplied by 50, or half the number of terms: that is to say, 10,100 yards, which makes more than 5½ miles.

THE ARITHMETICAL MOUSETRAP.

One of the best and most simple mousetraps in use may be as



notch cut across nearly at the top of it, to fit the top of No. 1, and the other end of it trimmed to catch the notch in No. 3, (see No. 2.) The third piece should be twice as long as either of the others; a notch, similar to that in No. 2, must be cut in one end of it, to catch the lower end of No. 2. Having



proceeded thus far, you must put the pieces together, in order to finish it, by adding another notch in No. 3, the exact situation of which you will discover as follows:—Place No. 1, as it is in the cut, then put the notch of No. 2 on the thinned top of No. 1; keep it in the same inclination as in the cut; then get a flat piece of wood, or slate, one

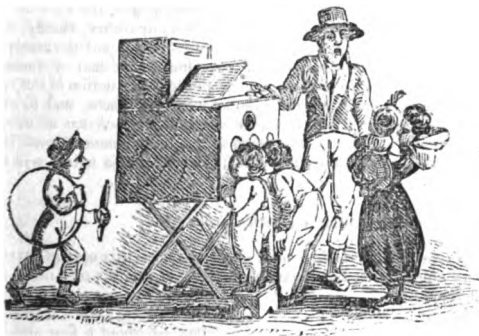
end of which must rest on the ground, and the centre of the edge of the other on the top of No. 2. You will now find the thinned end of No. 2 elevated by the weight of the flat piece of wood or slate; then put the thinned end of it in the notch of No. 3, and draw No. 2 down by it, until the whole forms a resemblance of a figure 4: at the exact place where No. 3 touches the upright, cut a notch, which, by catching the end of No. 1, will keep the trap together. You may now bait the end of No. 3 with a piece of cheese; a mouse, by nibbling the bait, will pull down No. 3, the other pieces immediately separate, and the slate or board falls upon the mouse. We have seen numbers of mice, rats, and birds, caught by this

Figure of 4 Trap.





OPTICAL AMUSEMENTS



What wonders may be brought to pass,
 By the optician's magic glass!
 A barley-corn of painted paper,
 Illumin'd by a farthing taper,
 Into a spacious plain extendeth,
 Whereon Dan Sol his hot glance bendeth
 The leech's paltry, dark green potion
 Is magnified into an ocean:
 His little, crabb'd, perspective scrawl,
 Into th' hand-writing on the wall:
 Look one way, and a blow-fly's nose
 To elephant's proboscis grows:
 Turn t'other end, hippopotamus
 Becomes a gnat compared with a mouse.

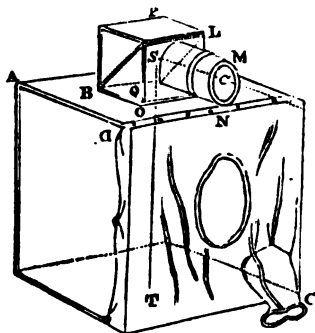
The science of optics affords an infinite variety of amusements, which
 cannot fail to instruct the mind as well as delight the eye. By the aid of



are not a small portion of the powers which this science offers to man ; to enumerate them all would require a space equal to the body of our work : neither do we propose to notice, in the following pages, the various instruments and experiments which are devoted solely, or rather, chiefly, to purposes merely scientific ; it being our intention merely to call the attention of our juvenile readers to such things as combine a vast deal of amusement with much instruction ; to inform them as to the construction of the various popular instruments ; to show the manner of using them, and to explain some of the most attractive experiments which the science affords. By doing thus much, we hope to offer a sufficient inducement to push inquiry much further than the information which a work of this nature will enable us to afford.

THE CAMERA OBSCURA.

We give our young friends a brief description of this optical invention ; though very common, it is extremely amusing ; almost every one has seen



it, but few persons know how to construct it. A C represents a box of about a foot and a half square, shut on every side except at D C ; O P is a smaller box, placed on the top of the greater ; M N is a double convex lens, whose axis makes an angle of forty-five degrees with B L, a plane mirror, fixed in the box, O P ; the focal length of the lens is nearly equal to $CS + ST$, i. e., to the sum of the distances of the lens from the middle of the mirror, and of the middle of the mirror from the bottom of the large box. The lens being turned toward the prospect, would form a picture of it, nearly at its focus ; but the rays, being intercepted

by the mirror, will form the picture as far before the surface as the focus is behind it, that is, at the bottom of the larger box ; a communication being made between the boxes by the vacant space, Q O. This instrument is frequently used for the delineation of landscapes : for which purpose, the draughtsman, putting his head and hand into the box, through the open side

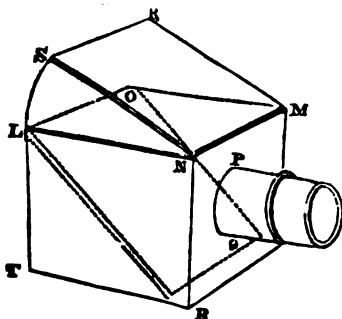


OPTICAL AMUSEMENTS

11.

D C, and drawing a curtain round to prevent the admission of the light which would disturb the operation, can trace a distinct outline of the picture that appears at the bottom of the box.

There is another kind of camera obscura, for the purposes of drawing constructed thus: in the extremity of the arm, P Q, that extends from the side of a small square box, B L, is placed a double convex lens, whose axis is inclined in an angle of forty-five degrees, to a plane mirror, B O; the focal length of the lens is equal to its distance from the side of the box, O T; therefore, when the lens is turned toward the illuminated prospect, it would project the image on the side, O T, if the mirror were removed; but this will



reflect the image to the side, M L, which is as far distant from the middle of the mirror as this is from the side, O T. It is there received on a piece of glass, rough at the upper side, and smooth at the lower, and appears in its proper colors on the upper side of the plate. It is evident that in each of these instruments the image is inverted with respect to the object M S is a lid to prevent the admission of light during the delineation of the picture; and others, for the same purpose, are applied to the sides, M R and N L.

You may also construct the camera obscura in a room, thus.—you first darken the room, by closing the shutters, and every place where the external light can be admitted. You then cut a circular hole in the shutter, or a board placed against the window, in which you place a lens, or convex glass, the focus of which is at the distance of not less than four, nor more than fifteen or twenty feet: from six to twelve feet is the best distance this distance, also, place a pasteboard, covered with the whitest paper, a black border, to prevent any of the side rays from disturbing the picture it be two feet and a half long, and eighteen or twenty inches high; and



front of the window will be painted upon the paper, in an inverted position with the greatest regularity, and in the most natural colors.

There is another method of making the camera obscura, by a scioptical ball; that is, a ball of wood, through which a hole is made, in which hole a lens is fixed: this ball is placed in a wooden frame, in which it turns freely round; the frame is fixed to the hole in the shutter, and the ball, by turning about, answers, in great part, the use of the mirror on the outside of the window. If the hole in the window be not bigger than a pea, the objects will be represented without any lens.

If you place a movable mirror without the window, by turning it more or less, you will have upon the paper all the objects which are on each side of the window.

The inverted position of the images may be deemed an imperfection, but it is easily remedied; for, if you stand above the board, on which they are received, and look down upon it, they will appear in their natural position: or, if you stand before it, and, placing a common mirror against your breast, in an oblique direction, look down in it, you will there see the images erect, and they will receive an additional lustre from the reflection of the glass; or, place two lenses in a tube that draws out; or, lastly, if you place a large concave mirror at a proper distance before the picture, it will appear before the mirror in the air, and in an erect position.

If, instead of putting the mirror without the window, you place it in the room, and above the hole, (which must then be made near the top of the shutter,) you may receive the representation on a paper placed horizontally on a table, and draw all the objects that there appear painted.

THE MAGNIFYING CAMERA OBSCURA.

Let the rays of light that pass through the lens in the shutter be thrown on a large concave mirror, properly fixed in a frame. Then take a slip or thin plate of glass, and sticking any small object to it, hold it in the incident rays, at a little more than the focal distance from the mirror, and you will see, on the opposite wall, amidst the reflected rays, the image of that object, very large, and extremely clear and bright.

THE PRISMATIC CAMERA OBSCURA.

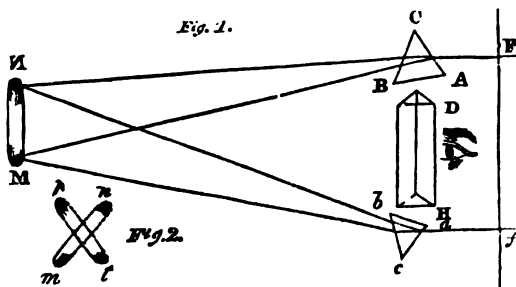
Make two holes, F, f , (Fig. 1,) in the shutter of a dark chamber, near to each other; and against each hole, a prism, ABC , and abc , in a perpendicular direction, that their spectrums, MN , may be cast on the paper in a horizontal line, and coincide with each other; the red and violet of the one being in the same part with those of the other. The paper should be



OPTICAL AMUSEMENTS.

113

placed at such a distance from the prisms that the spectrum may be sufficiently dilated. Provide several papers nearly of the same dimensions with the spectrum, cross these papers, and draw lines parallel to the divisions of the colors: in these divisions cut out such figures as you may find will have an agreeable effect, as flowers, trees, animals, &c. When you have placed one of these papers in its proper position, hang a black cloth or paper behind it, that none of the rays that pass through may be reflected, and confuse the phenomenon: the figure cut on the paper will then appear strongly illuminated with all the original colors of nature.



If, while one of the prisms remains at rest, the other be revolved on its axis, the continual alteration of the colors will afford a pleasing variety: which may be further increased, by turning the prism round in different directions. When the prisms are so placed that the two spectrums become coincident in an inverted order of their colours, the red end of one falling on the violet end of the other. if they be then viewed through a third prism.



CAMERA LUCIDA.

Opposite to the place or wall where the appearance is to be, make a hole of at least a foot in diameter; or, if there be a high window with a casement of that dimension in it, this will do much better, without such hole or casement opened. At a convenient distance, to prevent its being perceived by the company in the room, place the object or picture intended to be represented, but in an inverted situation. If the picture be transparent, reflect the sun's rays by means of a looking-glass, so that they may pass through it toward the place of representation; and, to prevent any rays from passing aside it, let the picture be encompassed with some board or cloth. If the object be a statue, or a living creature, it must be enlightened by casting the sun's rays on it, either by reflection, refraction, or both. Between this object and the place of representation put a broad convex glass, ground to such a convexity as that it may represent the object distinctly in such place. The nearer this is situated to the object, the more will the image be magnified upon the wall, and the further, the less; such diversity depending on the difference of the spheres of the glasses. If the object cannot be conveniently inverted, there must be two large glasses of proper spheres, situated at suitable distances, easily found, by trial, to make the representation correct. This whole apparatus of object, glasses, &c. with the persons employed in the management of them, are to be placed without one window or hole, so that they may not be perceived by the spectators in the room, and the operation itself will be easily performed.

THE POLEMSCOPE.

By a polemoscope you may see what passes in another place without being seen from thence yourself: it may be made by fixing, in a common opera-glass, a small mirror, inclined to an angle of forty-five degrees, and adjusting a proper object-glass; by this, while appearing to look straight forward, you may see what passes on one side of you. This instrument may also be so constructed that the tube may turn round, and the mirror elevated or depressed, that you may see successively, and at pleasure, all the objects that you would perceive, if you were at the top of the wall against which the instrument is placed.

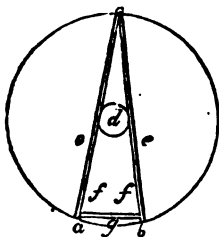
THE KALEIDOSCOPE.

To construct this instrument procure a tube of tin, brass, pasteboard, or any other material, eight or ten inches long, and one and a half or two inches in diameter; place a cap upon one end, with a small hole in the



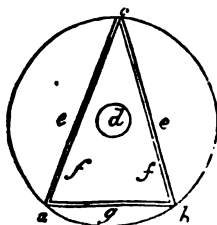
centre, at the circumference of the circle, *d*, in the annexed figure, which is a view of the right end of the instrument, from which the cap has been removed. The circle is the edge of the tube, the lines, *a c* and *b c*, are the edges of the two reflecting surfaces, which are nearly of the same

length as the tube: they may be made of two pieces of looking-glass, or of plate-glass or crown-glass, which have been blackened on one side at *e e*, the surfaces *ff*, being well polished. The blackening may be effected with the smoke of a lamp simply, or upon varnish, or with any other black matter which effectually resists the rays of light; and the two reflectors must be kept apart at *g*, by means of a piece of cork, or any other substance, placed at each end of the tube. At *c*, where the reflectors join, they should be straight, and adapted to each other; or they may be placed differently, or even parallel, as in



the figure following. At the other end of the tube, (the object end,) where the two reflecting surfaces, *a c b c*, terminate, a circular piece of ground glass is to be fitted into the tube, and retained there by means of a piece of wire, which is to be bent to a circle, and placed upon the glass to keep it steady. Over this end let another tube be fitted, an inch or two in length

at least, capable of being turned round, and, at its end, let another circular piece of glass, smooth, be fitted in, similarly to the preceding. Into this outer cap, or tube, put the objects to be viewed, which may consist of any semi-transparent colored substances, as glass, beads, shells, or pearls, and the like, but not too many at a time. Place the cap on, and then, advancing the tube to the eye, still keeping the side, *a b*, upward, look through at *d*, and you will have a brilliant symmetrical repetition of the objects which are





it in double and opposite oscillations. Standing still, however, the draughtsman may copy off upon paper the *shapes* that present themselves, if he cannot hope to equal the varied tints, which are developed in succession, each new one delighting the eye by the perfection of its forms and the brilliancy of its coloring, both of which depend upon previously managing the objects to be viewed, and the angle at which the two reflectors, *d c*, and *b c*, are fixed.

Instead of two reflectors, this instrument may be constructed with three or more such planes, which may be arranged differently as regards each other: but the perfection of the kaleidoscope is to be found in procuring the reflection of distant natural objects, and in reducing them to the size proper for pictorial representation. This may be accomplished by fixing upon the object end a convex lens, fastened to the *slider tube*, which must then be nearly as long as the inner one, in order that the right focus may be found, which is adapted to the particular object; so two or three lenses may be kept, of several focal lengths, which should be always less than as greatest distance from the sight-hole, and will be found, generally, at from one-fourth to a third of that distance. A further variation, however, may be obtained, by introducing two lenses; one fixed to the inner tube, the other to the slider; and approaching to or receding from these, by means of the slider, the focus will be found.

As a matter of economy to those who may possess a telescope, it is suggested, that the size of the kaleidoscope may be made to correspond with that instrument, so that its glasses may be occasionally borrowed. A concave glass, placed at the sight-hole, (*d*, fig. 2,) will throw the objects off, and reduce their size by taking care that the focal length be equal to the length of the *reflectors*.

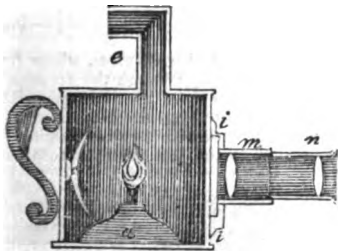
Supposing the instrument to contain twenty small pieces of glass, &c. and that you make ten changes in each minute, it will take the inconceivable space of 462,880,899,576 years and 360 days, to go through the immense variety of changes it is capable of producing, amounting (according to our frail idea of the nature of things) to an eternity. Or, if you take only twelve small pieces, and make ten changes in each minute, it will then require 83,264 days, or 91 years and 49 days, to exhaust its variations.

THE MAGIC LANTERN.

The object of this ingenious instrument is to represent, in a dark room, on a white wall or cloth, a succession of enlarged figures, of remarkable, natural, or grotesque objects. The figure in the next page is a representation of one. It consists of a tin box, with a funnel on the top, represented by *e*, and a door on one side of it. This funnel, by being bent, as shown in the figure, serves the double purpose of letting out the smoke, and keeping in



the light. In the middle of the bottom of the box is placed a movable tin lamp, *a*, which must have two or three good lights, at the height of the centre of the polished tin reflector, *c*. In the front of the box, opposite the reflector, is fixed a tin tube, *m*, in which there slides another tube, *n*. The



sliding tube has, at its outer extremity, a convex lens, of about two inches diameter; the tube, *m*, also has a convex lens fixed in it, as shown in the figure, of three inches diameter. The focus of the smaller of these lenses may be about five inches. Between the tube, *m*, and the lamp, there must be a slit or opening, (as at *i*) to admit of the passage of glass sliders, mounted in paper or wooden frames, such as are represented below; upon which sliders

it is that the miniature figures are painted, which are intended to be shown upon the wall. The distinctness of the enlarged figures depends not only upon the goodness of the magnifying glass, but upon the clearness of the light yielded by the lamp, *a*. It may be purchased ready made of any optician.



To paint the glasses. Draw on a paper the subject you desire to paint. Lay it on a table or any flat surface, and place the glass over it: then draw the outlines, with a very fine pencil, in varnish mixed with black paint, and, when dry, fill up the other parts in their proper colors. Transparent colors must be used for this purpose, such as carmine, lake, Prussian blue, verdigris, sulphate of iron, tincture of Brazil wood, gamboge, &c.; and these must be tempered with a strong white varnish, to prevent their peeling off. Then shade them with black, or with bistre, mixed with the same varnish.

To exhibit the Magic Lantern. The lamp being lighted, and the room darkened, place the machine on the table, at some distance from the white



wall or suspended sheet, and introduce into the slit, *i. e.*, one of the sliders represented above, with the figures inverted. If the movable tube, *n*, be then pushed in or drawn out, till the proper focus be obtained, the figures on the slider will be reflected on the wall, in their distinct colors and proportions, with the appearance of life itself, and of any size, from six inches to seven feet, according to the distance of the lantern from the wall. Movements of the figures are easily made by painting the subject on two glasses, and passing the same through the groove.

To represent a tempest. Provide two plates of glass, whose frames are so thin, that they may both pass freely through the groove of the common magic lantern at the same time. On one of these paint the appearance of the sea, from the slightest agitation to the most violent commotion; representing first, a calm; afterward a small agitation, with some clouds; and so on to the end, which should exhibit a furious storm.



These representations are not to be distinct, but run into each other, that they may form a natural gradation; and great part of the effect depends on the perfection of the painting, and the picturesque appearance of the design.

On the other glass, paint vessels of different forms and dimensions, and in different directions, together with the appearance of clouds in the tempestuous parts.



Both glasses being done, pass the first slowly through the groove; and when you come to that part where the storm begins, move it gently up and down, which will produce the appearance of a sea that begins to be agitated, and so increase the motion till you come to the height of the storm. At the same time introduce the other glass with the ships, and, moving that in like manner, they will exhibit a natural representation of the sea, and of ships in a calm and in a storm. As the glasses are drawn slowly back, the tempest will seem to subside, the sky grow clear, and the ships glide gently over the waves.



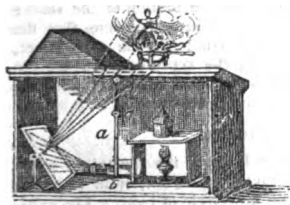
OPTICAL AMUSEMENTS

119

By means of two glasses, disposed in the before-mentioned manner, numberless other subjects may be represented.

THE APPARITION.

Enclose a small magic lantern in a box large enough to contain a small swing dressing-glass, which will reflect the light thrown on it by the lantern in such a way, that it will pass out at the aperture made at the top of



the box, which aperture should be oval, and of a size adapted to the cone of light to pass through it. There should be a flap with hinges, to cover the opening, that the inside of the box may not be seen. There must be holes in that part of the box which is over the lantern, to let the smoke out; and over this must be placed a chafing-dish, of an oblong figure, large enough to hold several lighted coals. This chafing-dish, for the better carrying on the deception, may be inclosed in a

painted tin box, about a foot high, with a hole at top, and should stand on four feet, to let the smoke of the lantern escape. There must also be a glass planned to move up and down in the groove, *a b*, and so managed by a cord and pulley, *c d e f*, that it may be raised up and let down by the cord coming through the outside of the box. On this glass, the spectre (or any other figure you please) must be painted, in a contracted or squat form, as the figure will reflect a greater length than it is drawn.

When you have lighted the lamp in the lantern, and placed the mirror in a proper direction, put the box on a table, and, setting the chafing-dish in it, throw some incense in powder on the coals. You then open the trap door and let down the glass in the groove slowly, and when you perceive the smoke diminish, draw up the glass that the figure may disappear, and shut the trap door.

This exhibition will afford a deal of wonder: but observe, that all the lights in the room must be extinguished; and the box should be placed on a high table, that the aperture through which the light comes out may not be seen.

THE NEBULOUS MAGIC LANTERN

The light of the magic lantern, and the color of images, may not only be painted on a cloth, but also reflected by a cloud of smoke. Provide a



box of wood or pasteboard, about four feet high, and seven or eight inches square at bottom, but diminishing as it ascends, so that its aperture at top be but six inches long, and half an inch wide. At the bottom of this box there must be a door that shuts quite close, by which you are to place in the box a chafing-dish with hot coals, on which is to be thrown incense, whose smoke goes out in a cloud at the top of the box : on this cloud, you are to throw the light that comes out of the lantern, and which you bring into a smaller compass by drawing out the movable tube. The common figure will here serve.

It is remarkable in this representation, that the motion of the smoke does not at all change the figures ; which appear so conspicuous that the spectator thinks he can grasp them with his hand. In the experiment, some of the rays passing through the smoke, the representation will be much less vivid than on the cloth ; and if care be not taken to reduce the light to its smallest focus, it will be still more imperfect.

THE PHANTASMAGORIA.

In the exhibition of the common magic lantern, the spectators see a round circle of light with the figures in the middle of it ; but, in the Phantasmagoria, they see the figures only, without any circle of light. The exhibition is produced by a magic lantern, placed on that side of a half-transparent screen which is opposite to that on which the spectators are, instead of being on the same side, as in the ordinary exhibition of the magic lantern. To favor the deception, the sliders are made perfectly opaque, except in those places that contain the figures to be exhibited, and in these light parts the glass is covered with a more or less transparent tint, according to the effect required. The easiest way is to draw the figures with water colors on thin paper, and afterward varnish them. To imitate the natural motions of the objects represented, several pieces of glass, placed behind each other, are occasionally employed. By removing the lantern to different distances, and, at the same time, altering, more or less, the position of the lens, the images are made to increase and diminish, and to become more or less distinct at the pleasure of the exhibitor ; so that, to a person unacquainted with the effect of optical instruments, these figures appear actually to advance and recede.

To make transparent screens for the Phantasmagoria. Transparent screens are prepared by spreading white wax, dissolved in spirits of wine or oil of turpentine, over thin muslin : a screen so prepared may be rolled

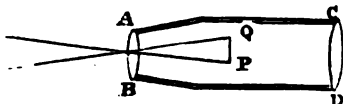


OPTICAL AMUSEMENTS.

121

SOLAR MICROSCOPE.

The solar microscope is constructed in the following manner. In the inside of a tube is placed a convex lens, A B, and at a distance a little greater than its focal length, but less than double of it, is fixed some transparent colored object, Q P, at the focus conjugate to the place of the object



A broad lens, C D, is placed before the object, to collect the solar rays, for the purpose of illuminating it more strongly, and, consequently, making the image more distinct and vivid.

TO CONSTRUCT A LANTERN WHICH WILL ENABLE A PERSON TO READ BY NIGHT AT A GREAT DISTANCE.

Make a lantern of a cylindric form, or shaped like a small cask placed lengthwise, so that its axis may be horizontal, and fix in one end of it a parabolic or spheric mirror, so that its focus may fall about the middle of the axis of the cylinder. If a small lamp or taper be placed in this focus, the light passing through the other end will be reflected to a great distance, and will be so bright that the very small letters on a remote object may be read, by looking at them with a good telescope. Those who see this light, if they be in the direction of the axis of the lantern, will think they see a large fire.

THE CHINESE SHADOWS, (OMBRES CHINOISES.)

Make an aperture in a partition wall, of any size; for example, four feet in length and two in breadth, so that the lower edge may be about five feet from the floor, and cover it with white Italian gauze, varnished with gum-copal. Provide several frames of the same size as the aperture, covered with the same kind of gauze, and delineate upon the gauze different figures, such as landscapes and buildings, analogous to the scenes which you intend to exhibit by means of small figures representing men and animals.

These figures are formed of pasteboard, and their different parts are made movable, according to the effect intended to be produced by their shadows, when moved backward and forward behind the frames, and at a small distance from them. To make them act with more facility, small wires, fixed to their movable parts, are bent backward, and made to terminate in rings, through which the fingers of the hand are put, while the figure is supported by the left, by means of another iron wire. In this manner they may be



made to advance or recede, and to gesticulate, without the spectators observing the mechanism by which they are moved; and, as the shadow of these figures is not observed on the paintings till they are opposite those parts which are not strongly shaded, they may thus be concealed, and made to appear at the proper moments, and others may be occasionally substituted in their stead.

It is necessary, when the figures are made to act, to keep up a sort of dialogue, suited to their gestures, and even to imitate the noise occasionally by different circumstances. The paintings must be illuminated from behind, by means of a reverberating lamp, placed opposite to the centre of the painting, and distant from it about four or five feet. Various amusing scenes may be represented in this manner, by employing small figures of men and animals, and making them move in as natural a way as possible, which will depend on the address and practice of the person who exhibits them.

THE MARVELLOUS MIRROR.

In the wainscot of a room make two openings, of a foot high, and ten inches wide, and about a foot distant from each other: let them be at the common height of a man's head; and, in each of them, place a transparent glass, surrounded with a frame, like a common mirror. Behind this partition place two mirrors, one on the outward side of each opening, inclined to the wainscot in an angle of forty-five degrees; let them be both eighteen inches square; let all the space between them be enclosed by boards or pasteboard, painted black, and well closed, that no light may enter; let there be also two curtains to cover them, which may be drawn aside at pleasure. When a person looks into one of these supposed mirrors, instead of seeing his own face he will perceive the object that is in the front of the other; so that, if two persons present themselves at the same time before these mirrors, instead of each one seeing himself they will reciprocally see each other. There should be a sconce with a candle or lamp placed on each side of the two glasses in the wainscot, to enlighten the faces of the persons who look in



When a man looks in a mirror that is placed perpendicularly to another, his face will appear entirely deformed. If the mirror be a little inclined, so as to make an angle of eighty degrees, (that is, one-ninth part from the perpendicular,) he will then see all the parts of his face, except the nose and forehead : if it be inclined to sixty degrees, (that is, one-third part,) he will appear with three noses and six eyes : in short, the apparent deformity will vary at each degree of inclination ; and when the glass comes to forty-five degrees, (that is, half-way down,) the face will vanish. If, instead of placing the two mirrors in this situation, they are so disposed that their junction may be vertical, their different inclinations will produce other effects ; as the situation of the object relative to these mirrors is quite different.

INGENIOUS ANAMORPHOSIS.

This recreation shows how to draw, on a flat surface, an irregular figure, which shall appear, when seen from a proper point of view, not only regular, but elevated. Provide a thin board, about two feet long and one foot wide, as A B C D, and place thereon a circular piece of card or stiff drawing paper, on which a distorted figure is to be drawn, that, being viewed from the point, H, shall appear regular, and exactly resembling that which is placed at M F.

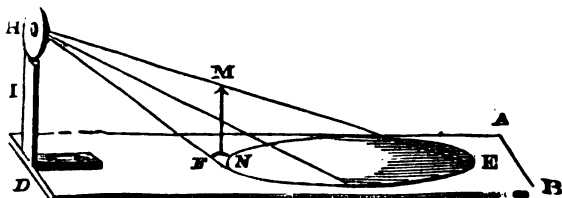


FIG. 20. At the end of the board, an upright piece, I, of thin wood or tin, of



lighten the surface of your paper, and there show, in a distorted form, the subject that is painted on the glass.



Then draw, with a pencil, all the strokes of the shadow as they appear, and, taking away the light, replace the upright side-piece, I, and see if what you have drawn correspond with the subject on the glass, correcting what imperfections there may happen to be. In the last place, color the subject, so traced, with the utmost attention, inspecting your work, from time to time, from the point of view, before you give it the finishing stroke. When the figure, that is drawn and painted on your paper, is viewed from the sight, H, it appears to be at the same point where the glass, M F, was placed, and in the same form that it was painted on the glass. It appears to the eye even elevated above the surface of the board on which the drawing is placed, and there-

by receives a remarkable and pleasing illusion.

SINGULAR ILLUSION.

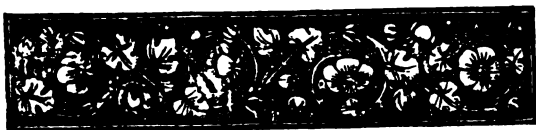
Atfix to a dark wall a round piece of paper an inch or two in diameter, and, a little lower, at the distance of two feet on each side, make two marks; then place yourself directly opposite to the paper, and hold the end of your finger before your face in such a manner, that when the right eye is open, it shall conceal the mark on the left, and, when the left eye is open, the mark on the right; if you then look with both eyes to the end of your finger, the paper, which is not at all concealed by it from either of your eyes, will, nevertheless, disappear.

ANOTHER.

Fix, at the height of the eye, on a dark ground, a small round piece of white paper, and a little lower, at the distance of two feet to the right, fix up another, of about three inches in diameter; then place yourself opposite to the first piece of paper, and, having shut the left eye, retire backward, keeping your eye still fixed on the first object: when you are at the distance of nine or ten feet, the second will entirely disappear from your sight.

THE MULTIPLIED MONEY.

Take a large drinking-glass, of a conical form, that is, small at bottom and wide at top, and, having put into it a shilling, let it be half filled with water; then place a plate upon the top of the glass, and turn it quickly over, that the water may not get out: a piece of silver as large as half-a-crown will immediately appear on the plate and, somewhat higher up another piece of the size of a shilling



CHEMICAL AMUSEMENTS



They play such merry pranks, that some would think
 They entertained an imp to conjure for them.
 Yet 'tis not so ;—their few hours of pastime,
 These young disciples of the Alchemist
 Adorn with feats, which, to the unlearned eye,
 Show off like magic :—but grandam Wisdom
 Knows them as recreations of young Science,
 In sportive mood, upon a holyday.

CHEMISTRY has been called, by its votaries, a fascinating science, and with some truth, for it certainly affords more recreation than any other : but it is the most useful of all sciences cannot be denied, nor can there be a doubt that it has a tendency almost to enchant those who devote their



nquiring mind of youth to skim lightly and agreeably over its surface : so this purpose, we have selected a series of experiments for their amusement, not doubting but that they will consider the time profitably spent in perusing them, and we flatter ourselves that they will be an inducement to carry heir inquiries much further than our limits will afford. For those who wish to be instructed as well as amused, we have added some explanations of the decompositions, or chemical changes, which take place, in order to show that, although almost magical in appearance, they are dependent upon some fixed and unerring law of nature. Without any further prefatory observations, we shall now commence our Chemical Recreations.

CRYSTALLIZATION OF SALTS.

1. Dissolve one ounce of sulphate of soda (Glauber's salts) in two ounces of boiling water ; pour it while hot, into a phial, and cork it close. In this state it will not crystallize when cold ; but if the cork be removed, the crystallization will commence and proceed rapidly.

The presence of atmospheric air is necessary in the process of crystallization ; the experiment will occasionally fail when under unfavorable circumstances : should this be the case, drop into the fluid a crystal of Glauber's salt, and the whole will immediately commence shooting into beautiful crystals.

2. Repeat the above experiment with a small thermometer immersed in the solution, and corked up with it. When cold, remove the cork, and the thermometer will be seen to rise. This experiment shows that heat is given out in the act of crystallization.

3. Take half an ounce of caustic soda, (common soda,) and dissolve it in about its own weight of water ; then pour into the solution half an ounce of sulphuric acid (oil of vitriol :) when the mixture is cold, crystals of sulphate of soda will be found in the liquor.

4. Take caustic soda, and pour upon it muriatic acid : this will produce muriate of soda, our common table salt.

5. Take of carbonate of ammonia, (the common volatile smelling salts,) and pour upon it muriatic acid until the effervescence ceases. The produce will be a solid salt, viz. muriate of ammonia, or crude salammoniac of the shops. Caustic substances corrode matter in consequence of their tendency to unite with it ; they continue to act upon it until they are saturated by the combination.

6. Mix two ounces of semi-vitrified oxyd of lead (litharge) with three grains of muriate of ammonia, and submit the whole to a strong heat in a crucible. The heat will drive off the ammonia, and the muriatic ac



will combine with the lead, forming a muriate of lead. When the operation is complete, pour the ingredients into a metallic vessel to cool and crystallize. This is the patent yellow used by painters.

In this experiment, the lead is dissolved by the muriatic acid, which has been disengaged by the heat driving off the ammonia with which it was previously combined.

SYMPATHETIC INKS.

1. Write with a diluted solution of muriate or nitrate of cobalt, and the writing will be invisible; but, upon being held to the fire, it will appear perfectly distinct, and of a blue color: if the cobalt should be adulterated with iron, the writing will appear of a green color. When taken from the fire, the writing will again disappear. If a landscape be drawn and all finished with common colors, except the leaves of the trees, the grass and the sky, and the latter be finished with this sympathetic ink, and the two former with the adulterated solution just mentioned, the drawing will seem to be unfinished, and have a wintry appearance; but, upon being held to the fire, the grass and the trees will become green, the sky blue, and the whole assume a rich and beautiful appearance.

2. Write with a diluted solution of muriate of copper, and the writing will be invisible when cold; but, on being held to the fire, it will appear of a yellow color. A landscape may be drawn and finished, as in the last experiment, and, in addition to the sympathetic inks there used, corn fields may be painted or finished with this sympathetic ink. The whole will have a very drear and bleak aspect till held before a fire, when it will instantly assume a cheerful and lively appearance, as if by magic. If human beings be drawn in common colors, as if in the act of reaping, the whole will appear more curious and interesting. These landscapes will, at any time, exhibit the same appearance.

3. Write with a weak solution of alum in lemon-juice, and the characters will remain invisible until wetted with water, which renders them of a grayish color, and quite transparent. A letter written with a solution of rock-alum alone, being dried, and having a small quantity of water poured over it, will appear of a whiter color than the paper.

4. Write with a weak solution of sulphate of iron, (green vitriol;) when dry it will appear invisible; but if wetted over with a brush, dipped in tincture of galls, or a strong decoction of oak bark, the writing will be restored, and appear black.

5. Write with the above solution; when dry, wash it over with a solution of prussiate of potash, and the writing will be restored to a beautiful blue.



In all secret or sympathetic writing, as it is called, there is a *chemical decomposition*: this is more particularly striking in the two last experiments; in the former of which, the gallic acid unites with the iron, forming a black; and in the latter, the prussic acid unites with the iron, forming a blue, or prussiate of iron.

HEAT AND COLD.

1. Take one ounce of muriate of ammonia, the same quantity of nitrate of potash, (saltpetre,) and two ounces of sulphate of soda: reduce these salts separately into powder, and mix them gradually with four ounces of water; the result will be, that as the salts dissolve, cold will be produced. A thermometer, immersed in the mixture, will sink at or below the freezing point. If a test tube be filled with water, and immersed in the mixture the water will soon be frozen.

The above mixture is frequently used at the tables of the great, to cool wine when ice cannot be procured.

2. Put a small quantity of sulphuric acid (oil of vitriol) into a glass or cup, and pour upon it about half its quantity of cold water; upon stirring it, the temperature will rise to many degrees above boiling water. In mixing sulphuric acid with water, great care should be taken not to do it too suddenly, as the vessel may break from the increased heat, and the acid be spilled on the hands, clothes, &c.; the greatest caution is necessary in using it, as it will burn almost anything it touches.

3. Dissolve a little lime in muriatic or nitric acid, then pour some of the liquid into a glass, and add to it a few drops of sulphuric acid; the whole will become nearly a solid mass, and, at the same time, give out a strong heat.

4. Set a quart pot upon a stool, on which a little water has been previously thrown, before the fire; put a handful of snow into the pot, and also a handful of common salt. Hold the pot fast with one hand, and with a short stick stir the contents with the other, as if you were churning butter; in a few minutes the pot will freeze so hard to the stool, that with both hands you can scarcely disengage it.

5. The most powerful of all freezing mixtures is a mixture of muriate of lime and snow: to produce the greatest effect by this mixture, equal weights of the salt, finely powdered, and newly-fallen snow, must be quickly mixed together. This is the mixture that is employed to freeze quicksilver.

Whenever substances become more condensed by mixture, heat is given out; when they expand, cold is produced: or perhaps, it would be more proper to say, the compound has more or less capacity for heat than the separate ingredients.



6. Fill a common thermometer tube with cold water, and suspend it in the air by a string: if the tube be continually sprinkled with ether, the water will presently become ice.

All liquids require a great portion of heat to convert them into vapour, and all evaporation produces cold. The quick evaporation of ether, in the above experiment, carries away the heat from the water, and converts it into ice. An animal might be frozen to death in the midst of summer, by being repeatedly sprinkled with ether.

COMBUSTION AND EXPLOSION.

1. Bruise, and slightly moisten with water, a few crystals of nitrate of copper; then roll them up quickly in a piece of tin-foil: in about a minute the tin-foil will begin to smoke, and soon after, take fire and explode with a slight crackling noise.

2. Throw a few grains of chlorate of potash, (oxmuriate of potash,) and a very small bit or two of phosphorus, into a cup containing a little sulphuric acid, the phosphorus will instantly burst into flame.

3. Take five parts of nitrate of potash, (saltpetre,) three of sub-carbonate of potash, (salt of tartar,) and one of sulphur, all quite dry, and mix them together in a warm mortar: if a little of this powder be placed upon a shovel, over a hot fire, it first begins to blacken, and, at last, melts and explodes with a loud report. A small quantity only should be used; for although there is no danger in the mixture, yet some nervous persons may be alarmed at the loudness of the report.

4. Put a small quantity of calcined or pure magnesia into a cup, and pour over it a sufficient quantity of sulphuric acid to cover it: almost immediately combustion will commence, and sparks will be thrown out in all directions.

5. Put a little dry pulverized charcoal into a warm tea-cup, and pour over it some nitric acid, when combustion will take place, as in the preceding experiment.

6. Pour a table-spoonful of oil of turpentine into a cup, and place it in the open air; then put about half the quantity of nitric acid, mixed with a few drops of sulphuric, into a phial, fastened to the end of a long stick; pour it upon the oil, and it will immediately burst into flames, and continue to give out much light and heat.

7. Rub a few grains of chlorate of potash, and about half the quantity of sulphur, together in a mortar, and a crackling detonation will be produced accompanied with flashes of light. If a small quantity of the same



mixture be wrapped in paper, laid upon an anvil, and smartly struck with a hammer, a report will be produced, which will be loud in proportion to the quantity used.

8. Take a little of the composition mentioned in the last experiment, on the point of a knife, and drop it into a wine glass containing sulphuric acid; a beautiful column of flame will be the consequence immediately it comes in contact with the acid.

9. Mix a few grains of chlorate of potash with twice their quantity of loaf sugar reduced to powder; place this mixture upon a plate, dip a piece of wire in sulphuric acid, and let a single drop fall from its end upon the mixture; it will immediately burst into flame, and continue to burn till the whole is consumed.

10. Take a metal button, and rub it for a short time against a piece of wood or stone, then touch a small piece of phosphorus with it, the latter will immediately take fire and burn.

11. Hold the end of a rod of glass to a grindstone while it is revolving; in a very short time it will become so hot, that phosphorus, gunpowder, and other combustible bodies, may be inflamed by it. Wood rubbed against wood will also produce great heat. The natives of New Holland light their fires by these means.

12. Put a small piece of German tinder into the lower end of a syringe, then draw up the piston and force it suddenly down by giving it a smart blow against a wall or table, when the tinder will be ignited, either from the sudden condensation of the air, or the friction occasioned by the movement of the piston. Syringes for this purpose are sold in London at about half-a-guinea each.

13. Take two pieces of common bonnet cane and rub them strongly against each other in the dark, and a considerable quantity of light will be produced. Two pieces of borax have the same property in a more eminent degree. In this, and the three preceding experiments, the effects described being produced by friction, they ought, in strict propriety, perhaps, to be called electrical rather than chemical experiments.

14. *Combustion by concentrating the sun's rays.* Hold a double convex glass, of about two inches diameter, to the sun, about mid-day when shining very bright, at its focal distance from a piece of coin, which will soon become so hot that it cannot be touched with the finger. The intensity of the heat produced will depend upon the size and convexity of the glass, and also on the season of the year. Gunpowder, phosphorus, &c may be set on fire in this manner; and, with a very powerful glass, *unus* of the metals may be melted.



18. Put a small quantity of spirits of wine into a glass with a halfpenny or a shilling, then direct the rays of the sun, by means of a glass, upon the coin, and, in a short time, it will become so hot as to inflame the spirits.

COMBUSTION IN AND UNDER WATER.

1. Mix one grain of phosphorus with three or four grains of chlorate of potash, and put this mixture into a glass with a narrow bottom; then put the small end of a funnel into the glass, in contact with the mixture, and fill the glass nearly full of water, but not by means of the funnel; then pour a few drops of sulphuric acid down the funnel, and the combustion of the phosphorus will immediately commence, and continue till the whole is consumed.

2. *The Well of Fire.* Add, gradually, one ounce, by measure, of sulphuric acid to five or six ounces of water, contained in an earthenware basin; throw in an ounce of granulated zinc, and a small bit or two of phosphorus, when phosphuretted hydrogen gas will be produced, which takes fire immediately it comes in contact with atmospheric air; so that, in a short time, the whole surface will become luminous, and continue so long as gas is generated, which may be seen darting from the bottom through the fluid with great rapidity.

3. Fill a saucer with water, and let fall into it a grain or two of potassium; the potassium will instantly burst into flame with a slight explosion, and burn vividly on the surface of the water, darting, at the same time, from one side of the vessel to the other, with great violence, in the form of a beautiful red-hot fire ball.

4. *Will-o'-the-wisp.* Take a glass tumbler three parts filled with water, and drop into it two or three lumps of phosphuret of lime; a decomposition will take place, and phosphuretted hydrogen gas be produced, bubbles of which will rise through the water, and take fire immediately they burst through the surface, terminating in beautiful ringlets of smoke, which will continue until the phosphuret of lime is exhausted.



of the fluid. When this takes place, drop into the mixture a few pieces of phosphuret of lime; this will immediately illumine the bottom of the vessel, and cause a stream of fire, of an emerald green color, to pass through the fluid.

The effects produced in the foregoing experiments, are occasioned by the sudden chemical decomposition which takes place; and here it may be necessary to caution our young friends not to exceed the quantities we have directed to be used; for although we have avoided everything that is dangerous, yet an excess of quantity, in some cases, might be attended with inconvenience, and create alarm from the sudden effects that are produced. When phosphorus is used, it should be handled with great care, lest any portion of it get under the finger nails, a small bit of which would occasion considerable pain for sometime.

LUMINOUS WRITING IN THE DARK.

Fix a small piece of solid phosphorus in a quill, and write with it upon paper; if the paper be then removed to a dark room, the writing will appear beautifully luminous.

GREEN FIRE.

Put a small quantity of highly-rectified spirits of wine, mixed with a little boracic acid, into an earthenware vessel, and set them on fire, when a very beautiful green flame will be produced.

RED FIRE.

Proceed as in the last experiment, using nitrate or muriate of strontites, instead of boracic acid, and a beautiful red flame will be produced.

YELLOW FIRE.

Proceed as above, mixing nitrate or muriate of barytes with the spirits, and a brilliant yellow flame will be produced.

The above methods have been used in our theatres to heighten the effect of some of those horrifying spectacles with which the city has been treated, such as *Der Freyschütz*, &c.

METALLIC DISSOLVENTS.

Gold. Pour a small quantity of nitro-muriatic acid upon a small piece of gold, or gold leaf, and, in a short time, it will completely disappear, and the solution will have a beautiful yellow color.

Silver. Pour a little nitric acid upon a small piece of pure silver, or silver leaf, and it will be dissolved in a few minutes.



Copper. Pour a little diluted nitric acid upon a small piece of copper and, in a short time, the copper will be dissolved, and the solution will have a beautiful blue color.

Lead. Pour a little diluted nitric acid upon a small piece or two of lead, which will first convert it into a white powder, and then dissolve it.

Iron. Pour some sulphuric acid, diluted with about four times its bulk of water, upon a few iron filings; a violent effervescence will ensue, and, in a little time, the filings will be dissolved.

These experiments are intended to show how easily we can dissolve metals when we submit them to a proper menstruum.

METALLIC VEGETATION.

Mix together equal parts of saturated solutions of silver and mercury, diluted with distilled water: in this mixture suspend five or six drachms of pure mercury in a piece of fine linen rag doubled. The metallic solutions will soon shoot into beautiful needle-shaped crystals, and attach themselves, and adhere strongly, to the bag containing the mercury. When the arborization ceases to increase, the bag, loaded with beautiful crystals, may be taken out of the vessel where it was formed, by means of the thread by which it is suspended, and hung under a glass jar, where it may be preserved as long as may be thought proper.

THE LEAD TREE.

Put into a common wine decanter about half an ounce of super-acetate of lead, (sugar of lead,) and fill it to the bottom of the neck with distilled or rain water; then suspend, by a bit of silk, or thread, fastened also to the cork or stopper, a piece of zinc wire, two or three inches long, so that it may hang as nearly in the centre as possible; then place the decanter where it may not be disturbed. The zinc will very soon be covered with beautiful crystals of lead which are precipitated from the solution, and this will continue until the whole becomes attached to the zinc, assuming the form of a tree or bush, whose leaves or branches are laminal, or in scales of metallic lustre.

THE TIN TREE.

Into the same, or a similar vessel, to that used for the lead tree, pour distilled or rain water, as before, and put in three drachms of muriate of tin, and about ten drops of nitric acid. When the salt is dissolved, suspend a piece of zinc wire, as in the last experiment, and set the whole aside to precipitate without disturbance. In a few hours the effect will be similar to that produced by the lead, only that the tree of tin will have more lustre. In these experiments it is wonderful to see the lamina, or thin plates, shoot out, as it were, from nothing.



THE SILVER TREE.

Put into a decanter four drachms of nitrate of silver, and fill up the decanter with distilled or rain water; then drop in about an ounce of mercury,

and place the vessel where it may not be disturbed: in a short time the silver will be precipitated in the most beautiful arborescent form, resembling real vegetation.



The above experiments show the precipitation of one metal by another, owing to the affinity that exists between them. The metal in solution having a greater affinity for the pure metal suspended in it, precipitates itself from the solution, and becomes firmly attached thereto. The Silver Tree, produced as above described, is

subsequently called *Arbor Dianæ*, or the *Tree of Diana*.

TRANSMUTATION OF COLORS.

To produce a blue by mixing two colorless fluids. Pour a little of the solution of sulphate of iron into a glass, then add to it a few drops of a solution of prussiate of potash, and the whole will assume a beautiful blue color.

In this experiment a decomposition takes place; the sulphuric acid leaving the iron to unite with the potash, and the prussic acid leaving the potash to unite with the iron, forming prussiate of iron, and sulphate of potash; the sulphate of potash remaining in solution, while the prussiate of iron is slowly precipitated, falling to the bottom in the state of a fine powder. This is the prussian blue of the shops.

To produce a yellow from two colorless fluids. Pour a little of the solution of nitrate of bismuth into a glass, then add to it a small quantity of solution of prussiate of potash, and a yellow color will be immediately produced.

In this experiment, as in the last, we have a decomposition; nitrate of potash and prussiate of bismuth are formed, the prussiate of bismuth giving the yellow color.

To produce a brown from two colorless fluids. Pour a little of the



solution of sulphate of copper into a glass, then add to it a small quantity of a solution of prussiate of potash, and a reddish brown will be produced.

In this experiment we have a sulphate of potash and a prussiate of copper, which gives the brown color, according to the principle just laid down.

To make black ink from two colorless fluids. Put into a glass a quantity of water, and add to it some tincture of galls; then put in a small quantity of a solution of sulphate of iron, and the whole will immediately become black.

Here, as in the preceding experiments, a decomposition is effected; the gallic acid uniting with the iron, forms our common writing ink.

A blue color produced from two colorless fluids. Put into a glass a quantity of water, and dissolve therein a few crystals of sulphate of copper, then pour in a small quantity of liquid ammonia, and the whole will immediately be changed to a beautiful blue.

In this experiment the ammonia unites to the copper, forming ammoniate of copper, which is of a beautiful blue, approaching to violet.

Another way. Take any chalybeate water, (that is, water containing iron in solution,) and add to it a little of the solution of prussiate of potash, which will change it to a blue color, as in a previous experiment.

Prussiate of potash is one of the best tests for iron that we are acquainted with, and will detect its presence, however minute the quantity.

To change a blue liquid to a red. Pour a little of the infusion of litmus, or blue cabbage, into a wine glass, and add to it a drop or two of acetic or sulphuric acid, which will immediately change it to a red color.

One of the characteristics of acid is that it changes most of the vegetable colors to red. This experiment is an instance.

To change a blue liquid to green. Pour a little of the infusion of violets into a wine glass, and add to it a few drops of a solution of potash or soda, when it will be changed to a beautiful green; to which, indeed, alkalies change most of the vegetable colors.

To change a red liquid into various colors. Put a little of the infu-



THE MAGIC SHRUB.

Place a sprig of rosemary, or any other garden herb, in a glass jar, so that when it is inverted, the stem may be downward, and supported by the sides of the vessel; then put some benzoic acid upon a piece of hot iron, so hot that the acid may be sublimed, which will rise in form of a thick white vapour. Invert the jar over the iron, and leave the whole untouched until the sprig be covered by the sublimed acid in the form of a beautiful hoar frost.

Sublimation is the same as distillation, only we call it sublimation when the product is collected in a solid form; the term distillation is applied to liquids. In the above experiment we have a beautiful instance of sublimation, the fumes of the acid rise and are condensed on the cold leaves of the plant.

A LAMP WITHOUT FLAME.

Procure six or eight inches of platinum wire, about the hundredth part of an inch in thickness; coil it round a small cylinder ten or twelve times, then drop it on the flame of a spirit lamp, so that part may touch the wick and part remain above it. Light the lamp, and when it has burned a minute or two, put it out; the wire will then be ignited, and continue so long as any spirit remains in the lamp.

Lamps manufactured on this principle are sold by some of the chemists in London.

THE EXPLODING TAPER.

If the light of a taper be blown out, and the taper be let down into a jar of oxygen gas while the snuff (which should be a thick one) remains red hot, it rekindles instantly with an explosion. When the taper is relighted, it continues to burn with a rapidity, a brilliancy of flame, and an evolution of light truly wonderful.

THE GLOW-WORM IN GAS.

Place a glow-worm within a jar of oxygen gas, in a dark room; the insect



filled with carbonic acid gas, and invert it over the jar in which the candle is placed; the effect is very striking; the invisible fluid, being heavier than atmospheric air, descends like water, and extinguishes the flame. The whole, to spectators who have no idea of substance without sensible matter, having the appearance of magic.

TO MAKE WATER BOIL BY COLD AND CEASE TO BOIL BY HEAT

Half fill a Florence flask with water, place it over a lamp, and let it boil for a few minutes, then cork the mouth of the flask as expeditiously as possible, and tie a slip of moist bladder over the cork to exclude the air. The water being now removed from the lamp, the ebullition will cease, but may be renewed by pouring cold water gradually upon the upper part of the flask; but, if hot water be applied, the boiling instantly ceases. In this manner the ebullition may be renewed, and again made to cease, alternately, by the mere application of hot and cold water.

We shall, in this place, be more elaborate than usual, and give our young friends the theory of what causes the above phenomenon. Be it known, then, to all who are not previously acquainted with the fact, that water boils at 212 degrees under the common pressure of our atmosphere: now, if the atmosphere, or a part of it, were removed, the pressure on the surface would be less, and the consequence would be that water would boil at a much lower temperature; and this leads us to an explanation of what takes place in the foregoing experiment. We fill a flask half full of water, and boil it for a few minutes over a lamp, the steam which rises forces out the atmospheric air, and occupies its place; we then remove the lamp, and secure the flask so as to prevent the readmission of atmospheric air. If cold water be now poured over that part of the flask occupied by the steam, the cold will condense the steam, which will trickle down the sides of the flask, and mix with the liquor below; the steam being thus condensed, a vacuum is formed above the surface. The water, having then no pressure of atmospheric air or steam, commences boiling afresh; but if hot water be now poured upon it, the steam again occupies the surface, and the boiling ceases.

A LIQUID PRODUCED FROM TWO SOLIDS.

Mix equal portions of sulphate of soda and acetate of lead, both in fine powder: let them be well rubbed together in a mortar, when the two solids will operate upon each other, and a fluid will be produced.

A SOLID PRODUCED FROM TWO LIQUIDS.

If a saturated solution of muriate of lime be mixed with a saturated solution of carbonate of potash, (both transparent liquids,) the result is the forma



ion of an opaque and almost solid mass. If a little nitric acid be added to the product, the solid mass will be changed to a transparent fluid.

These two last experiments were formerly called chemical miracles, but the present scientific age no longer consider them so, it being now well ascertained that the changes which take place are occasioned by chemical decomposition, or the action of one salt upon another.

THE LITTLE GAS-FACTOR.

Put a little coal into the bowl of a common tobacco-pipe, stop the mouth of it up with clay, and place the bowl in a fire; as soon as the coal becomes heated, a small stream of gas will issue from the top of the pipe. If he put a candle to it, the gas will light and burn for sometime, sufficiently brilliant to illuminate the study of

The little Gas-factor.





"O'er the ice as o'er pleasure, you lightly should glide,
Both have gulfs, which their flattering surfaces hide."

SKATING is by no means a modern pastime, and probably the invention proceeded rather from necessity than the desire for amusement. It was the boast of a northern chieftain, that he could traverse the snow upon skates of wood. Some traces of Skating are found in the thirteenth century, at which period it was customary in the winter, when the ice would bear them, for the young citizens of London to



The wooden Skates, shod with iron or steel, which are bound about the feet and ankles like the talares of the Greeks and Romans, were most probably brought into England from Holland, where they are said to have originated, and where, it is well known, they are almost universally used by persons of both sexes, when the season permits. In the *Encyclopedia Britannica*, it is asserted that Edinboro' has produced more instances of elegant skaters than perhaps any other country whatever; and the institution of a Skating Club there has contributed not a little to the improvement of this amusement. Strut, in noticing this, observes, that when the Serpentine river in Hyde park was frozen over, he saw four gentlemen there dance, if the expression may be allowed, a double minuet, in skates, with as much ease, and perhaps more elegance, than in a ball-room; others again, by turning and winding with much adroitness, have readily in succession described upon the ice all the letters of the alphabet.

THE SKATE.

Skates are of various forms, and differ in their make, according to the several countries in which they are used. In England, where they are intended for amusement only, a much lighter description is made than in Holland or Russia, where, in the winter, they form one of the principal modes of travelling, even for great distances. The shape of the Iron gives the peculiar feature to the skate. In the northern countries it is made to project six or eight inches beyond the wood, and cur. npwards at the extremity, to nearly the height of the knee. In Lapland the iron projects nearly two feet. The reason for this is very clear, it enables the skater to glide easily over the hillocks of ice or snow, which invariably collect on the rivers in those climates; were the irons not made so, the inhabitants could not travel on the ice with safety to themselves, or to the various articles which they sometimes carry: it being a common occurrence for women to skate to market, carrying on their heads a basket full of eggs.

Skates are made fluted or plain. For young beginners the former are preferable, as regards safety; but with the latter only can velocity and elegance of movement be acquired. The blade of the skate should not project much beyond the wood, or, when the skater bears forward, the hind part of the foot will be raised too much from the ice, the back of the leg liable to become cramped, and the power of striking out greatly decreased. A quarter of an inch in thickness, and about three-quarters of an inch in height, are proportionate dimensions for the blades of skates. High bladed skates are dangerous for beginners and require considerable exertion of the muscles to keep the ankle stiff while the nearer the feet are brought to the ice, without risking their contact, the less will be that strain, and the greater the facility of mov



ing in all directions. The blades should be slightly curved at the bottom, as this form assists the skater in turning either heel or toe outwards or inwards with rapidity. Previously to going on the ice, the learner should practise, both walking about with his skates on, and balancing himself on either feet.

FASTENING THE SKATES. The old-fashioned broad ankle strap with two large rings, is now but little used. It pressed so much on the back part of the ankle, as to prevent the play of the foot, and frequently gave much pain. Having bored a hole in the heel of each boot just large enough to receive the pegs, fold your handkerchief up into a pad, on which kneel with your right knee, and put on the left skate first. Then kneel on the left knee while adjusting the right skate.—The long single strap, passed twice through the skate and crossed on the foot, is found to be sufficient, provided the skate be well fastened into the heel of the boot; a back-strap however may be used by beginners. The best mode is to have the skate well screwed to the sole of a lace-up boot,—this is the method adopted by the members of the *Skating Club* in London. The spring skate, in which there is no wood, is preferred by some to all others.

HOW TO START OFF, AND TO STOP.

When your skates are strapped, rise up, stand on your heels, and stamp them on the ice to fix the foot firmly; then strike out, at first slowly, with the right foot, leaning on the inside edge of the skate, and bend-

Fig. 1.



Fig. 2.



Fig. 3.





ing slightly forward. When you have slid about two yards on the foot, put the other on the ice, and gently throw your weight upon it, striking out in the same manner upon the inside edge, and so on with each foot alternately. Fig. 1 represents the attitude of a learner at first starting off. When you wish to stop, raise the toes from the ice, and rest on your heels as in Fig. 2. Bend the body forwards gradually, and do not attempt to lean backwards, the certain consequence of which would be a severe fall. A stick is used by some beginners to steady themselves but we do not advise it. It is better, at first, to have the support of a companion who can skate, (Fig. 3.) and by degrees he may leave you to your own exertions; above all things, do not be disheartened by a few falls.

HOW TO PERFORM THE VARIOUS EVOLUTIONS.

Before the skater attempts to cut figures and other devices, he must be able to skate on the outside edge of the skate, to skate backwards, and to turn round. The 'outside edge' implies what it is by its name; when acquired, it sends you exactly in opposite directions, on both sides, to what the 'inside edge' does. In explanation:—Suppose that you are skating on the right foot, it is easy to turn to the left, but not so to the right, to effect which you must use the outside edge, by striking out upon it either foot, inclining at the same time the skate, the leg, the body, and the head, toward which ever side you are skating, holding the other foot raised up behind, and rounding the arms.

Fig. 4.



The right hand should be raised towards the head in skating on the left outside edge, and the left hand when skating on the right outside edge, as in Fig. 4. The most difficult forward movement is the cross outside edge, which is done by passing one leg across the other,

and striking out with the foot as it comes down on the ice. As the foot on which you first rested disengages itself (which it will do as you proceed) from the crossed-leg po-

Fig. 5.





sition, throw that leg over the other, and, by continuing this, you will soon learn to sweep round on either side with ease. Fig. 5. This is called the Mercury Figure.

The salute in a right line is not easy of execution. Having first struck out, you must place the feet in a horizontal line, elevating and rounding the arms. Continue the movement as long as you can, or think fit to do so. This attitude, though difficult, is frequently practised by good skaters.

The salute in a curved line is much easier. Having started, you put your feet in the position you would adopt to describe the salute in a right line, (see Fig. 6.) only less horizontally. The head and

Fig. 6.



body must be upright, the arms rounded, the hands placed on the haunches; in this position you describe a circle. You then draw yourself up, the knees having become slightly bent, and, raising the right or left foot, prepare for another evolution; as either striking out straight forward, or towards one side.

To describe circles and curves will be found the most graceful and useful of evolutions. To describe a curve on the outside edge forwards, fix on some point as a centre, and take a run proportioned to the number of curves you propose describing. Strike out on the outward edge, turning in a curve round the centre fixed upon. Your eyes

must look towards the shoulder opposite that which directs the general movement of the side on which you turn; your arms must be extended; the one directing the movement should be raised above the head, and the other held downwards, in the direction of the leg describing the curve. (Fig. 7.) The hips must be kept in, and the leg on which you are propelled bent slightly at the knee-joint. The opposite leg must also be bent, and thrown backwards, to

Fig. 7.





Fig. 2.



small piece of cork, or any other light body, as a centre, take a sufficient run, and strike out on the inward edge. Your head and body must be in the position described for outward curves, only the leg on which you skate must not be bent. The opposite leg should be almost stiff, and the foot about 18 inches from the one you rest upon. Fig. 8. Curves on the inside edge are terminated by stopping in the usual manner; but if you desire to pirouette, or turn round, you throw the foot on which you do not skate over that on which you do, and, from the impulse given to your body in order to describe the curve, you spin round on the middle of the skate as on a pivot. After hav-

ing done this a few times, you bring down the foot you are not revolving on, and proceed to other evolutions.

To skate backwards, you must incline the head and body slightly forward, in order not to lose the centre of gravity. Strike out behind on each foot alternately, and raise the heel of the skate slightly up from the ice (Fig. 9.) By this operation each foot will describe an arc or segment of a circle. Should you feel to be losing your equilibrium, bring both skates together on the ice.

This evolution is performed sometimes on one foot, sometimes on the other, and occasionally on both together, by the help of a slight motion of the hips.

Retrograde or backward curves differ from ordinary curves by their direction only: and at first sight appear difficult, because a person cannot move backwards with the same facility that he can go forward. When however you are used to this manner of skating, it will appear natural and tolerably easy of execution. The backward curve is of equal importance with the ordinary curve on the outside edge, and constitutes the base of all retrograde or backward figures. In this evolution the position of the arms and head is

Fig. 3.





SKATING.

145

Fig. 10.



not the same as for the ordinary curve on the outside edge. When executing the outward retrograde curve, your face must be turned towards the left shoulder, and the right hand raised towards the head. Fig. 10. The reverse takes place for the movement to the left, and the inverse generally when the motion is forward instead of backward. The backward curve may be extended to circles, spiral rings, as shown by Figs. 11 and 12, and be finally concluded by the pirouette.

The oblique stop is the most proper to adopt when you are skating backwards. In order to perform it, when engaged in a retrograde movement, you bring down on the ice in an oblique and transverse position the skate on which you are not resting, stiffening at the same time the leg you thus bring down. See Fig. 13 on the

next page. The effect of this manoeuvre is prompt and certain, and the only variation it admits of is, that it can be performed on either foot. To turn round, bring either heel behind the other, and you turn as a matter of course.

By carefully attending to the above directions, with practice, you will be able to cut the numerical figures, or any device that you may wish. The Figure 8 is the best practice, and is described by com-

Fig. 11.



Fig. 12.





SKATING

FIG. 12.



pleting the circle on the outside edge forward. This is performed by crossing the legs, and striking from the outside instead of the inside edge. To cross the legs, the skater, as he draws to the close of the stroke on his right leg, must throw the left quite across it, which will cause him to press hard on the outside of the right skate, from which he must immediately strike, throwing back the left arm, and looking simultaneously over the left shoulder, so as to bring him well upon the outside edge of the left skate. The 8 is formed by completing a perfect circle, in the manner described, on each leg, before changing the foot. The figure 3, which is performed on the inside edge backwards, may next be practised.

CONCLUDING OBSERVATIONS.

The young skater should avoid both very rough and very smooth ice. He must be fearless, but not too violent in his motions, and should never be in a hurry. He must avoid looking downwards to see how his feet act, and should recover his balance between each stroke. For safety his body may be bent slightly forward during his first essays, but when he has acquired sufficient confidence, he should bear himself erect, carry his head well up, and always turn his face in the direction of the line he purposes describing.

He should wear flannel next his chest to absorb the perspiration caused by the exercise, and avoid skating against the wind, if of a delicate constitution. When unexpected danger arises, he should strive to be perfectly collected. If surrounded by rotten ice he must crawl on his hands and knees, that the support of his weight may be distributed. If he fall upon rotten ice at full length, he must roll away from it towards firmer ice; and should he be so unlucky as to get into a hole, he must extend both arms outwards in opposite directions upon the surface of the ice, and tread water until assistance come. A plank or ladder offer the best means of extrication, either being easily pushed along the ice; or a rope may be thrown to the person immersed; but we hope our young readers by prudence and caution will avoid the necessity of their application.







LEGERDEMAIN.

We cannot, if our life depended on it, remember where we first saw the greatest author of the day,—nor when, within three or four years, we first shook the “great captain of the age” by the hand; but the memory of that moment, which revealed to our delighted young gaze the mountebank in all his glory of grimace, is as fresh within us, nay, more so, than if it were only a fruition of



our mind's eye, but the substance itself is almost buried in oblivion ;—while every feature of that seeming magician, who swallowed fire—kept it alive and brilliant below the surface of water,—enacted other feats of apparent dominion over the elements,—caused dumb figures to give proper answers to all sorts of questions,—padlocked an urchin's cheek,—and in a hundred ways cheated our eyes, before we had well worn out our second suit of boy's clothes,—is as well remembered, as though we had never ceased to look upon him. He has long since been dead—his body is no more ; but in an instant we can conjure up his image, as he stood before us, smiling contentedly, while bathing his hands in molten lead ! The very order of the wonders he performed has not yet escaped us, and we doubt not, but that should we live to be gray-headed, we shall ever be able to tell the color of his eyes,—the precise position of a mole which he had on his face,—the first, second, third, fourth, and so on, up to the twentieth feat which he exhibited. He was an itinerant quack doctor's Jack Pudding,—a mountebank, as we afterwards ascertained ; but, at that time, we had not the least idea of who or what he could be. It was evident, to our unpractised eye, that he was not a mere mortal ; for, no man, as we thought, innocent as we were, could by any possibility conjure a shilling, which we held fast in our hand, into one of our little school-fellows' pockets, or make a haberdasher's shop of his mouth, and draw from it dozens upon dozens of yards of ribbons of all colors, and at the option of those around him ; we could not conceive that human flesh could withstand red-hot iron, or that any power short of witchcraft could remove a thing from before our eyes, which were all the time earnestly fixed on it, without our seeing its motion. What virtue was there, we reasoned thus, in "Hiccup doctine !" when uttered by the lips of another ? But no sooner did he pronounce those mysterious words, than money danced about as if it possessed life. Would "Crinkum Bovis, Domine Jovis !" restore a chicken to life after its head was cut off, were the phrase to come from any but him ? It was clearly impossible. What could he be then ? Certainly not a mere mortal ; and if not—what was he ? Here we were as much



shall bestow even more than our usual pains in making this article as rich and complete as can be consistent with the nature of our work. We think that it would be by no means rash in us to pledge ourselves, that there is no superior treatise on Legerdemain to be obtained; it is true, that there are a few more bulky ones, but they contain so much useless matter, and account of tricks which it is impossible to perform at all, or, at any rate, by the rude, antiquated instructions which they afford, that one half of them is useless. The following pages will, we trust, be found to contain everything that is valuable in this art, unencumbered with dross. We have brought a tolerable share of knowledge on this matter, to the preparation of "Feats of Legerdemain;" we have also gleaned the cream of several old and scarce works, and translated many choice recreations from foreign publications on this subject. Several friendly contributions have been afforded to us; and what is of the greatest value, we have been favored with the assistance of some eminent and highly popular professors of the art; so that, we are enabled to present to our young readers a collection of conjuring tricks, which is at once copious and select. Our object has been, not only to facilitate the acquisition of such a variety of amusing feats, as will render him, who is enabled to exhibit them, a parlor magician, but also to instruct our young readers in the mode of performing several master-pieces of Legerdemain, which require considerable agility, and expensive apparatus, so that they may understand the means of effecting the apparent wonders displayed by the public professors of the art. In addition to the Feats of Legerdemain, we have devoted several of our pages to descriptions of various Automata and Androides, which have been exhibited to the public. The Marionnettes, or figures, whose motions are governed by strings, are too simple for a lengthened notice: it is true, that, among the ancients, they were deemed of importance sufficient to be exhibited in their public shows,—but they are now mere toys, of which every lad knows the construction; for there are few who have not at one time or other possessed, played with, and dissected a pasteboard harlequin, or a bleeding nun. An improvement has lately been made on these juvenile Marionnettes, which, while we are on this



We doubt not but that this part of the work will be a favorite amusement with our readers, and that it will afford much innocent amusement during the long evenings of winter, around the comfortable parlor fire, to many a little social circle. Such is our end and intent; and we assure those who amuse themselves, whether alone or in society, with these Feats of Legerdemain, that they are indulging only in what is often instructive generally agreeable, and always innocent.

We must detain our readers from the practical instructions, to make a few more observations, which are necessary, as well on our own behalf as for their benefit. We wish it to be remembered, that in addition to the matter contained under this title, many excellent scientific recreations, which will be accounted capital conjuring tricks, are to be found in the preceding pages, among the Chemical, Arithmetical, and Optical Amusements, and elsewhere in the work; where they are more properly placed than they would be here; and to these we take leave to refer those who have an inclination to become "Magiciens de Societs."

THE POISED PENNY.

Place a smooth card on the tip of the middle finger of your left hand, and on it, nicely balanced, and with its centre exactly over your finger's point, a penny-piece. Then, by a smart fillip with the middle finger of your right hand, you may strike away the card from under the penny, leaving the latter poised on the tip of your finger. A very little practice will enable you to do this trick without ever failing. The card must be carefully struck, so as to drive it straight off the finger; if you fillip it upward, it will, of course, take the penny with it. (*Vide cut at head.*)

WATER BEWITCHED.

Pour some water into a plate, light a bit of loosely-crumpled paper, and throw it into a glass; then turn the glass upside down, with the burning paper in it, in the plate, and the water will gradually rise from the plate into the glass, until the latter becomes half full, so that the surface of the water it contains is much higher than that of what is left in the plate.

FIRE UNDER WATER.

Fasten a small bit of wood across the mouth of a glass, stick therein a piece of candle lighted, and, with a steady hand, convey the mouth to the surface of the water; then push it carefully down, and the candle will burn under the water; you may even bring the candle up again lighted. In the same manner, you may put a handkerchief, rolled tightly together, and it will not be wet.



LEGERDEMAIN

153

The principal art in performing this trick, consists in the nicety of bringing the mouth of the glass exactly level with the surface of the water for, if you put it in the least on one side, the water will rush in; and consequently put out the candle, or, in the other case, wet the handkerchief; so that a nice eye and steady hand are necessarily requisite for this performance.

THE SENTINEL EGG.

Lay a looking-glass upon an even table; take a fresh egg, and shake it for sometime, so that the yolk may be broken and mixed up with the white. You may then, with a steady hand, balance it on its point, and make it stand on the glass. This it would be impossible to do while the egg was in its natural state.

THE BRIDGE OF KNIVES

To erect the bridge of knives, you must first place three glasses, or small cups at the corners of a supposed triangle, and about the length of one of the knives you use distant from each other, upon a table, the floor, or any even surface. Then take three knives, and arrange them upon the glasses in the manner represented by the cut. The blade of No. 1 (as you may perceive by inspecting the engraving) goes over that of No. 2, and the blade of No. 2 passes across that of No. 3, which rests on that of No. 1. The



knives being placed in this position, their blades will support each other

ATABLE CANDLE-ENDS.

Peel some large apples that are rather of a yellow tint; cut several pieces out of them in the shape of a candle-end, round, of course, at the bottom, and square at the top; in fact, as much as possible, like a candle that has burnt down within an inch or so. Then cut some slices out of

THE LITTLE FLOATING BEACON.

Fasten a piece of lead to the end of a candle which has been half burnt, place it very gently in the water, so that it may find its proper equilibrium when light it, and it will burn to the end without sinking.

THE RINGS AND RIBBONS.

Take two pieces of ribbon, precisely alike in length, breadth, and color; double each of them, separately, so that their ends meet; then tie them together very neatly, with a bit of silk of their own color, by the middle, or crease made in doubling them. This must all be done beforehand. When you are going to exhibit this trick, pass some rings on the doubled ribbons, and give the two ends of one ribbon to one person to hold, and the two ends of the other to another. Do not let them pull hard, or the silk will break, and your trick be discovered by the rings falling on the ground, on account of the separation of the ribbons. Request the two persons to approach each other, and take one end from each of them, and without their perceiving it, return to each of them the end which the other had previously held. By now giving the rings, which appeared strung on the ribbon, a slight pull, you may break the silk, and they will fall into your hand.

THE THUMB-STRING.

This is a very simple trick, but by performing it quickly, you may surprise and puzzle a spectator very considerably. Wind a piece of string round your thumb, thus:—Let one end of it (a) drop between the thumb and fore-finger of your left hand; then wind the other part, which you retain in your right hand, two or three times round your thumb: next make a little loop (b)





LEGERDEMA'N.

155

WINE UPON WATER.

Half fill a glass with water, throw a bit of the crumb of a loaf into it, about the size of a nut, pour some wine lightly on the bread, and you will see the water at the bottom of the glass, and the wine floating at the top of it.

THE CONJUROR'S JOKE.

Take a ball in each hand, and stretch your hands as far as you can, one from the other; then state that you will contrive to make both the balls come into either hand, without bringing the hands near each other. If any one dispute your power of doing this, you have no more to do, than to lay one ball down upon the table, turn yourself, and take it up with your other hand. Thus both the balls will be in one of your hands, without their approaching each other.

THE PERILOUS GOBLET.

To fill a glass with water, so that no one may touch it without spilling all the water. Fill a common wine-glass or goblet with water, and place upon it a bit of paper, so as to cover the water and edge of the glass; put the palm of your hand on the paper, and taking hold of the glass with the other, suddenly invert it on a very smooth table, and gently draw out the paper; the water will remain suspended in the glass, and it will be impossible to move the glass, without spilling all the water.

THE ENCHANTED COCK.

Bring a cock into a room with both your hands close to his wings, and hold them tight; put him on a table, and point his beak down as straight as possible; then let any one draw a line, with a piece of chalk, directly from its beak, and all the noise you can possibly make will not disturb him, for some time, from the seeming lethargy, which that position you have laid him in has effected.

TO LIGHT A CANDLE BY SMOKE.



THE WONDERFUL RE-ILLUMINATION.

After having exhibited the trick of lighting a candle by smoke, retire to one corner of the room with a single candle, and pass the



hand, in which you hold the paper, several times slowly over the candle until the paper takes fire; then immediately blow the candle out, and presently, pass your hand over the snuff, and relight it with the paper. You may then crumple the paper, at the same time extinguishing the flame, by squeezing it suddenly, without burning yourself. If this trick be performed dexterously, it is a very good one. It is not necessary for the performance of this trick that all the other lights

in the room should be extinguished; in fact, the trick is more liable to a discovery in a dark room, than in one where the candles are burning, on account of the light thrown out by the paper while it is burning, previous to the re-illumination.

TO SUSPEND A RING BY A BURNT THREAD.

The thread having been previously soaked two or three times in common salt and water, tie it to a ring, not larger than a wedding ring. When you apply the flame of a candle to it, though the thread burn to ashes, it will yet sustain the ring.

THE ANIMATED SIXPENCE.

To make a sixpence leap out of a pot. This is done by means of a long



TO LIFT A BOTTLE WITH A STRAW

Take a straw, and having bent the thicker end of it in a sharp angle, as the figure subjoined, put this curved end into a bottle, so that the pen-part may rest against its side; you may then take the other end and lift up the bottle by it, without breaking the straw, and this will be the more readily accomplished as the angular part of the straw approaches nearer to that which comes out of the bottle. It is necessary, in order to succeed in this feat to be particularly careful in choosing a stout straw, which is neither broken nor bruised; if it have been previously bent or damaged, it is unfit for the purpose of performing this trick, as it will be too weak in the part so bent, or damaged, to support the bottle.



THE MOVING PYRAMID.

Roll up a piece of paper, or other light substance, and privately put into it any small insect, such as a lady-bird, or beetle; then, as the creature will naturally endeavor to free itself from captivity, it will move its covering towards the edge of the table, and when it comes there, will immediately return, for fear of falling; and thus, by moving backward and forward, will excite much diversion to those who are ignorant of the cause.

THE PAPER FURNACE.

Enclose a bullet in paper, as smoothly as possible, and suspend it above the flame of a lamp or candle; you will soon see it begin to melt and fall, drop by drop, through a hole which it will make in the paper; but the paper, except the hole mentioned, will not be burnt. The art of performing this trick consists in using a smooth round bullet, and enclosing it in the paper with but few folds or uneven places.

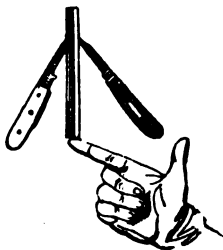
THE BOTTLE EJECTION.

Fill a small white glass bottle with a very narrow neck, full of wine; place it in a glass vase, which must previously have sufficient water in it to rise above the mouth of the bottle. Immediately, you will perceive the wine rise, in the form of a little column, toward the surface of the water, and the water will, in the meantime, begin to take the place of the wine at the bottom of the bottle. The cause of this is, that the water is heavier than the wine, which it displaces, and forces to rise toward the surface.



THE BALANCED STICK.

Procure a piece of wood about the length of your hand, half an inch thick; and twice as broad; within a short distance of one end of this piece, thrust in the points of the blades of two penknives of equal weight, in such a manner, that one of them may incline to one side, the second to the other, as represented by the cut in the margin. If its other extremity be placed on the tip of the finger, the stick will keep itself upright without falling; and if it be made to incline, it will raise itself again and recover its former situation. This is a very pretty performance, and, if properly managed, cannot fail to excite some surprise in the minds of those who behold it for the first time, as the knives, instead of appearing to balance the stick, rather appear to increase the difficulty which they in fact do, will of the feat.



STORM AND CALM.

Pour water into a glass until it is nearly three parts full; then almost fill it up with oil; but be sure to leave a little space between the oil and the top of the glass. Tie a bit of string round the glass, and fasten the two ends of another piece of string to it, one on each side, so that, when you take hold of the middle of it to lift up the glass, it may be about a foot from your hand. Now swing the glass to and fro, and the oil will be smooth and unruffled, while the surface of the water beneath it will be violently agitated.

THE TRAVELLING EGG.

Take a goose's egg, and, after opening and cleansing it, put a bat into the shell; glue it fast on the top, and the bat will cause the egg to move about in a manner that will excite much astonishment.

THE DOUBLED COIN.

Half fill a glass with water, and put a shilling or a sixpence into it; cover the glass with a plate, upon which, place one hand, while you hold the glass with the other; turn the glass upside down, so that none of the water may escape; place it on a table, and you will see the coin, at the bottom, larger than it is in reality, and another will appear, of the natural size, a little above it.



THE TOPER'S TRIPOD.

A trick similar to the Bridge of Knives may be performed by three tobacco-pipes, in the following manner:—Procure three common tobacco-



pipes; place the hollow part of the bowl of one of them on the table, as No. 1, and let its stem be supported by another, placed at No. 2; then put the other pipe across Nos. 1 and 2, (as No. 3,) so that its bowl end may support the stem of No. 2, and its own stem rest on the bowl end of No. 3. This little tripod, although constructed of such brittle materials, will, if carefully put together, support a jug of foaming October. When

used to show that it will support a weight, the three bowls should be brought considerably closer together than as represented in the marginal cut, so that the bottom of the jug may rest upon all three of the stems.

THE KNOTTED THREAD.

Considerable amusement, not unmixed with wonder, may be occasioned among a party of ladies, by a clever performance of this trick. It is most frequently performed by a female, but the effect of it is considerably increased when it is displayed by a boy. A piece of calico, muslin, or linen, is taken in the left hand, a needle is threaded in the presence of the spectators, and the usual, or even a double or treble knot made at the extremity of one of the ends of it. The operator commences his work by drawing the needle and the thread in it quite through the linen, notwithstanding the knot, and continues to make several stitches in like manner successively.

The mode of performing this seeming wonder, is as follows: a bit of thread, about a quarter of a yard long, is turned once round the top of the middle finger of the right hand, upon which a thimble is then placed to keep it secure. This must be done privately and the thread kept concealed, while a needle is threaded with a bit of thread of a similar length. The thread in the needle must have one of its ends drawn up nearly close, and be



THE BOTTLE IMPS.

Get three little hollow figures of glass, an inch and a half high, representing



imps, or Harlequin, Columbine, and Pantaloon, which may be obtained at the glass-blowers, with a small hole in each of their legs. Immerse them into water contained in a glass bottle, which should be about fifteen inches high, and covered with a bladder tied fast over the top. A small quantity of air must be left between the bladder and the surface of the water. When you think fit to command the figures to go down, press your hand hard upon the top, and they will immediately sink; when you would have them rise to the top, take your hand

away, and they will float up. By these means, you may make them dance in the middle of the glass at your pleasure.

THE BIRD IN THE BOX.

Get a box made with a false lid, on which glue some bird-seed; privately put a bird into it, under the false lid; then show it, and it will seem to be full of seed. Put on the true lid, and say,—“I will command all the seed out of this box, and order a living bird to appear.” Then, take off the covers together, and the bird will be seen.

THE MULTIPLYING MIRROR.

This feat must be performed with a looking-glass made on purpose; the manner of making it is this:—First, make a hoop, or fillet of wood or horn, about the size of a half-crown piece in circumference, and about a quarter of an inch in thickness. In the middle, fasten a bottom of wood or brass, and bore in it several small holes, about the size of peas; then open one side of this bottom, set in a piece of crystal-glass, and fasten it in the hoop close to



the bottom. Take a quantity of quicksilver, and put as much into the howe as will cover the bottom; then let into it another piece of crystal-glass, fitted to it; cement the sides, that the quicksilver may not run out, and the apparatus is complete. One side will reflect the beholder's face as a common looking-glass; in the other it will be multiplied according to the number of holes in the wood or brass.

THE BOGLE BODKIN.

Take a hollow bodkin, (or, if you prefer it, a dagger,) so that the blade may slip into the handle as soon as the point is held upward. Seem to thrust it into your forehead, (or, if a dagger, into your bosom,) then, after showing some appearance of pain, pull away your hand suddenly, holding the point downward, and it will fall out, and appear not to have been thrust into the haft; but, immediately afterward, throw the bodkin, or dagger, into your lap or pocket, and pull out another plain one like it, which will completely deceive the spectators.

THE PRANCING DRAGOON.

Cut out the figure of a Dragoon, mounted, in wood; let the horse be in a prancing position: put the hind-



legs on the edge of a table, and it will, of course, fall off; but you can prevent it from so doing, by adding to its weight. For this purpose, you must have a little hole made in the centre of its belly, into which run one end of a piece of wire, so bent backward, that the other end of it, to which a weight is fixed, may be under the table. The Dragoon will not only stand safe, but you may put him in motion, and he will prance up and down, without there being the least danger of his falling. The wire should be considerably longer in proportion to the size of the horse than is represented in the engraving in the margin, if you wish the figure

to come much below the edge of the table when prancing. If it be no longer than that shown in the cut, the horse's fore-legs can only descend to a distance equal to that between the weight at the end of the wire, and the



bottom of the table on which the figure is set. In fact, the Dragoon may be made to descend lower, and rise higher, in proportion to the length of the wire, if it be properly curved and fixed in the figure.

THE MYSTERIOUS BOTTLE.

Pierce a few holes, with a glazier's diamond, in a common black bottle place it in a vase or jug of water, so that the neck only is above the surface. Then, with a funnel, fill the bottle, and cork it well, while it is in the jug or vase. Take it out, and notwithstanding the holes in the bottom, it will not leak; wipe it dry, and give it to some person to uncork. The moment the cork is drawn, to the party's astonishment, the water will begin to run out of the bottom of the bottle.

THE HALF-CROWN UPHELD.

Privately cut the rim of the edge which is raised to protect the face of a half-crown, so that a little bit of the silver may stick up; take the coin in your right hand, and by pressing it with your thumb against a door or wainscot, the bit that sticks up will enter the wood, and thus support the half-crown.

THE BOWING BEAU.

Make a figure, resembling a man, of any substance, exceedingly light, such as the pith of the alder tree, which is soft, and can easily be cut into any form: then provide for it an hemispherical base, of some very heavy substance, such as the half of a leaden bullet, made very smooth on the convex part. Cement the figure to the plane part of the hemisphere; and, in whatever position it is placed, when left to itself, it will rise upright. In this manner were constructed those small figures, called Prussians, sold at Paris: they were formed into battalions, and being made to fall down, by drawing a rod over them, they immediately started up again as soon as it was removed. We think,





LEGERDEMAIN.

'63

THE WONDERFUL WAFERS.

On each side of a table-knife, place, in the presence of your company three wafers. Take the knife by the handle, and turn it over two or three times, to show that the wafers are all on. Desire some person to take off one wafer from one side of the blade; turn the knife two or three times again, and there will appear only two wafers on each side; remove another wafer, turn the knife as before, and there will appear only one wafer on each side; take the third wafer away, turn the knife as before twice or thrice, and there will appear to be no wafer on either side. After a momentary pause, turn the knife again two or three times, and three wafers will appear on each side.

The secret of this capital trick consists in using wafers of the same size and color, and turning the knife, so that the same side is constantly presented to the view, and the wafers are taken off that side, one by one. The three wafers will thus remain untouched on the other side, so that when you have first made it appear that there are no wafers on either side, you may, apparently, show three on each, by the same means. The way to turn the knife is as follows; when you lift it up, turn it in your hand, with your finger and thumb, completely round, until the side that was uppermost when you lifted it, comes uppermost again. This is done in an instant, and is not perceptible, if skilfully managed.

THE COUNTER CHANGED.

Take two papers, three inches square each, divided into two folds, of three equal parts on each side, so as each folded paper remain one inch square; then glue the back part of the two together, as they are folded, and not as they are opened, so that both papers seem to be but one, and which side soever you open, it may appear to be the same; if you have a sixpence in one hand, and a counter in the other, show one, and you may, by turning the paper, seem to change it.

THE CUT LACE JOINED.

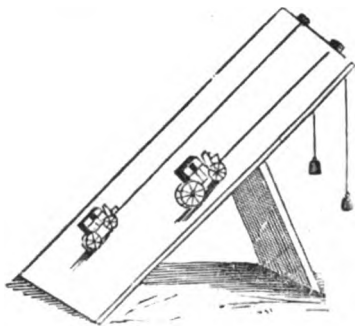
Conceal a piece of lace in your hand; then produce another piece of the same pattern; double the latter, and put the fold between your fore-finger and thumb, with the piece which you have previously concealed, doubled in the same manner; pull out a little of the latter, so as to make a loop, and desire one of the company to cut it asunder. If you have conveyed the concealed piece of lace so dexterously as to be undetected, with the other between your thumb and fore-finger, the spectators will, naturally enough think you have really cut the latter; which you may seem to make whole



again, while repeating some conjuring words, and putting away the two ends of the piece that is actually cut.

THE WIZARD'S CHARIOT.

This trick will call your mechanical abilities into play. First, get a piece of board, planed quite smooth; fasten a cross-piece under it, to support it in the position indicated by the cut. At the upper edge of the slanted piece fix two little pulleys, the use of which may, at a glance, be seen by the engraving. Next, construct two little coaches, carts, or classical triumphal chariots; let the wheels of one of them be considerably larger than those of the other; they must, however, be precisely the same weight, or, if not, you must load one with shot to make it equal, in this respect, to the other. Do your



work so neatly, that the wheels of each may run equally well on their respective axles. Next provide two lumps of lead, which must tally with each other to a scruple, and be sufficiently heavy to pull the chariots up the plane. Fix a piece of thread to the front of each of the chariots; pass these threads



THE SIMPLE DECEPTION.

Stick a little wax upon your thumb, take a by-stander by the fingers, show him a sixpence, and tell him you will put the same into his hand ; then wring it down hard with your waxed thumb, and, using many words, look him in the face ; suddenly take away your thumb, and the coin will adhere to it ; then close his hand it will seem to him that the sixpence remains ; now tell him to open his hand, and, if you perform the feat cleverly, to his great astonishment, he will find nothing in it.

PHILOSOPHY CHEATED.

This feat is really an excellent one, and has astonished crowds of spectators in London, and different parts of the United Kingdom. It was one of the favorites of a late popular professor, and is now first promulgated. Before you perform it in public, you must practice it, until you are quite perfect, in private, for it would be a pity to spoil its effect by making a blunder in it. Begin by stating very seriously, what is a well-known fact, that if a bucket full of water be hurled round his head by a man, who is sufficiently strong, none of the water will fall out. If this be at all discredited, be prepared not only to support your assertion, but to carry the point still further, by placing a tumbler full of any liquid in the inside of a broad hoop, which you hold in your hand by a small piece of string fixed to it, and twirling it round at your side. If you do this with velocity, although the tumbler, in the circles made by the hoop, is frequently quite bottom upward, it will neither fall from the hoop, nor will any of the water be spilt. To do this, however, requires even more practice than the trick which it prefaces ; as, although there is no difficulty in it while the hoop is in rapid motion, yet there is some danger until you are rendered expert by practice, of the tumbler's falling, when you begin to put the hoop in motion, and when you wish to stop it. If, therefore, you are not perfectly capable

P



of doing it, state the fact only, which some or other of your auditors will most probably support, as it is pretty generally known. You now go on to say, that the air, under the water in the glass, when it is topsy-turvy, keeps it in : and that, upon the same principle, if you can turn your hand, upon which you place a piece of thin wood, (about one inch broad, and six inches long,) sufficiently quick, although the back be uppermost, the air will actually keep the wood up against the palm of your hand, without any support.

This they will be readily inclined to believe ; the more philosophical the party is, the more easy may you lead them to credit your assertion. They will, however, doubt your being possessed of sufficient manual dexterity to perform it quick enough.



We must now tell you how it is to be done :—Lay the piece of wood across the palm of your left hand, which keep wide open, with the thumb and all the fingers far apart, lest you be suspected of supporting the wood with them. Next, take your left wrist in your right hand, and grasp it tightly, for the purpose, as you state, of giving the hand more steadiness. Now, suddenly turn

the back of your left hand uppermost, and, as your wrist moves in your right hand, stretch out the fore-finger of your right hand, and as soon as the wood comes undermost, support it with such fore-finger. You may now shake the hand, and, after a moment or two, suffer the wood to drop. It is two to one but the spectators will admit it to be produced by the action of the air, as you had previously stated, and try to do it





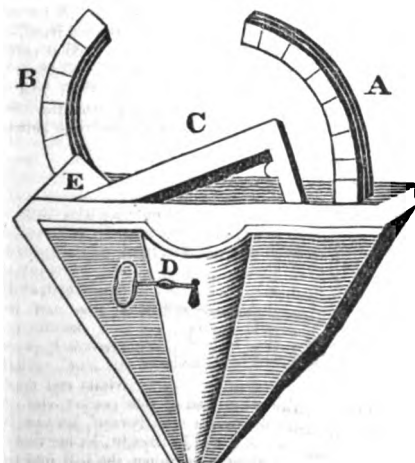
LEGERDEMAIN.

167

move your finger so carefully, that its action may not be detected ; and if it be not, you may rest satisfied that its absence from round the wrist of the left hand will not be discovered, some of the fingers being naturally supposed to be under the coat ; so that, if the spectators only see two or even one, they will imagine the others are beneath the cuff. There is one other observation necessary before we conclude ; it is this, when you have turned your hand over, do not keep the stick too long upheld, lest the spectators should take hold of your hands, and discover the trick ; before their astonishment has ceased, adroitly remove your fore-finger, and suffer the stick to fall to the ground.

THE LOCKED JAW.

A lock is made for the purpose, similar to the cut ; that side of its bow



marked A, must be fixed ; the other, B, must be pinned to the body of the lock, at E ; so that it may play to and fro with ease. This side of the bow should have a leg, with two notches filed on the inner side, which must be so contrived, that one may lock or hold the two sides of the bow as close together as possible, and the other notch hold them a proportionable distance asunder, so that when locked upon the cheek they may neither pinch too hard nor yet hold it so slightly that it may be drawn off. Let there be a key, D, to it ; and, lastly, let the bow have several notches filed in



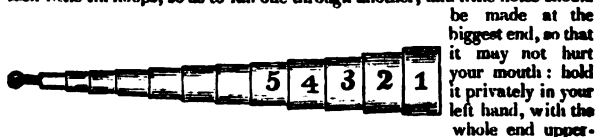
second person's teeth, pretending that your intent is to turn both into which of their mouths they please. This will afford you a fair opportunity of putting on your lock.

THE RESTORED THREAD.

Take two pieces of thread, one foot in length each; roll one of them round like a small pea, which put between your left fore-finger and thumb. Now, hold the other out at length, between the fore-finger and thumb of each hand; then let some one cut the same asunder in the middle; when that is done, put the tops of your two thumbs together, so that you may, with less suspicion, receive the thread which you hold in your right hand into your left, without opening your left finger and thumb. Then, holding these two pieces as you did before, let them be cut asunder in the middle also, and conveyed again as before, until they be very short; then roll all the ends together, and keep that ball of thread before the other in the left hand, and with a knife, thrust the same into a candle, where you may hold it until it be burnt to ashes; pull back the knife with your right hand, and leave the ashes, with the other ball, between your fore-finger and thumb of your left hand, and with the two thumbs and fore-fingers together, rub the ashes, and at length, draw out that thread which has been all this time between your fore-finger and thumb.

THE LONG PUDDING.

The following is a famous feat among those mountebanks who travel the country with quack doctors. This pudding must be made of twelve or thirteen little tin hoops, so as to fall one through another, and little holes should



most, and, with your right hand, take a ball out of your pocket, and say, "if there be any old lady that is out of conceit with herself, because her neighbours deem her not so young as she would be thought, let her come to me, for this ball is a certain remedy to cure her of her old age."



LEGERDEMAIN.

169

into your pocket without any suspicion, by making three or four wry faces after it, as though it had been too large for your throat.

THE EGG-BOX.

The egg-box is made in the shape of two bee-hives, placed together, A : the inner shell B, is covered with half the shell of a real egg ; the upper shell C, is of the same shape, but larger, being, in fact, the lid or upper part of the box, of which D is the lower. Place C, which is the outward shell, upon B, and both upon D, which arrangement puts all in readiness for the performance of the trick. Now call for an egg, and bid all the bystanders look at it, to see that it is a real one. Then take off the



upper part, B C, with your forefinger and thumb, and placing the egg in the box, say, "Ladies and gentlemen, you see it fairly in the box ;" and, uncovering it again, say, "You shall see me fairly take it out ;" putting it into your pocket in their sight. Now open your box again, and say, "There's nothing ;" close your hand about

the middle of the box, and taking C off without B, say, "There is the egg again ;" which will appear to the spectators to be the same that you put in your pocket ; then, put C on again, and taking C, together with the inner shell, B, off again, say, "It is gone again ;" and such will appear to be the fact.

THE OBEDIENT WATCH.

Borrow a watch from any person in company, and request the whole to stand round you. Hold the watch up to the ear of the first in the circle,



THE FLIGHT OF THE RING.

You may cause a ring to shift from one hand to another, and make it go on any finger required on the other hand, while somebody holds both your arms, in order to prevent communication between them, by attending to these instructions:—Desire some lady in company to lend you a gold ring recommending her, at the same time, to make a mark on it, that she may know it again. Have a gold ring of your own, which fasten by a small piece of catgut-string to a watch-barrel, and sew it to the left sleeve of your coat. Take the ring that is given you in your right hand; then putting, with dexterity, the other ring fastened to the watch-barrel, near the entrance of your sleeve, draw it privately to the fingers' ends of your left hand. During this operation, hide the ring that has been lent to you between the fingers of your right hand, and fasten it dexterously on a little hook, sewed for the purpose, on your waistcoat, and hidden by your coat. After that, show your ring, which hold in your left hand; then ask the company on which finger of the other hand they wish it to pass. During this interval, and as soon as the answer has been given, put the before-mentioned finger on the little hook, in order to slip the ring on it; at that moment let go the other ring, by opening your fingers. The spring which is in the watch-barrel, being confined no longer, will contract, and make the ring slip under the sleeve, without anybody perceiving it, not even those who hold your arms; as their attention will be occupied to prevent your hands from communicating. After this operation, show the assembly that the ring is come on the other hand; and make them remark that it is the same that had been lent to you, or that the mark is right. Much dexterity must be made use of to succeed in this entertaining trick, that the deception may not be suspected.

THE DEMI-AMPUTATION.

Provide yourself with two knives, a true and false one, (*vide cut*), and when you show this feat, put the true knife into your pocket, and, taking out the false one, place it



in your wrist undiscovered; then exhibit it, and you will appear to have nearly severed your arm.

THE MUTILATED HANDKERCHIEF RESTORED.

This feat, strange as it appears, is very simple; the performer must have a confederate who has two handkerchiefs of the same quality, and with the



LEGERDEMAIN

17

same mark, one of which he throws upon the table, to perform the feat with. The performer takes care to put this handkerchief uppermost in making a bundle, though he affects to mix them together promiscuously. The person, whom he desires to draw one of the handkerchiefs, naturally takes that which comes first to hand. The performer then desires to shake them again to embellish the operation; but in so doing, takes care to bring the right handkerchief uppermost, and carefully fixes upon some simpleton to draw; and if he find the person is not likely to take the first that comes to hand, he prevents him from drawing by fixing upon another, under pretence of his having a more sagacious look. When the handkerchief is torn, and carefully folded up, it is put under a glass upon a table placed near a partition. On that part of the table on which the handkerchief is deposited, is a little trap, which opens and lets it fall into a drawer. The confederate, concealed behind the curtain, passes his hand under the table, opens the trap, and substitutes the second handkerchief for the first. He then shuts the trap, which so exactly fits the hole it closes, as to deceive the eyes of the most incredulous. If the performer be not possessed of such a table, he must have a second handkerchief in his pocket, and change it by slight of hand.

THE DOUBLE FUNNEL.



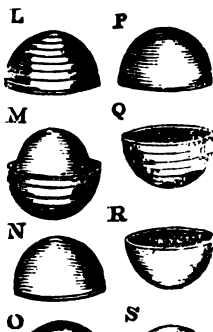
Get two funnels soldered one within the other, so as to appear like one; pour a little wine into the smaller end of the outside funnel, turn it up, and keep the wine in by placing your thumb at the bottom of the funnel; this must be done privately. Then pour some more wine into the broad part of the machine, drink it off completely; turn the broad end of the funnel downward, to show that all is gone; and instantly turning yourself about, pronounce some mystic terms; then withdraw your finger from the narrow end, so as to let the wine between the funnels run out.



bottle, let there be sufficient space to allow you to pour in some wine which will remain in the bottle outside the tube. Begin the trick by pouring a glass of wine out of the bottle; then place it on the table, over a concealed hole, through which the confederate will thrust a burning fusee into the tube, so that, at your command, fire is emitted from the mouth of the bottle. As soon as the fire is extinguished, or withdrawn, you can take up the bottle again, and pour out more wine.

THE GLOBE BOX.

This trick is not inferior to the best that is shown with boxes. It is done with a box made of four pieces, and a ball as big as may conveniently be contained therein; the ball serves, as the egg does in the egg-box, only to deceive the hand and eye of the spectators. This ball, made of wood, or ivory, is thrown out of the box upon the table, for every one to see that it is substantial; then put the ball into the box, which closes up with all the pieces one within another; remove the upper shell with your fore-finger and thumb, and there will appear another of a different color, red, blue, yellow, or any other color you may fancy; this will seem to be another ball, though, in fact, it is no more than a shell of wood, ingeniously turned, and fitted to the box, as you may perceive by the cuts in the margin. L is the outer shell of the globe, taken off the





the bird with air : have, also, a whole egg in readiness. Present the two eggs for one to be chosen ; put the egg, which contains the bird, next to the person who is to choose, and, for this purpose, be sure to select a lady : she naturally chooses the nearest to her, because, having no idea of the trick to be performed, there is no apparent reason to take the further one : at any rate, if the wrong one be taken, you do not fail in the trick, for you break the egg, and say—" You see that this egg is fair and fresh, madam ; so you would have found the other, if you had chosen it. Now, do you choose to find in it a mouse, or a canary-bird ? " She naturally declares for the bird, nevertheless, if she ask for the mouse, there are means to escape : you ask the same question of several ladies, and gather the majority of votes, which, in all probability, will be in favor of the bird, which you then produce.

THE PENETRATIVE SHILLING.

Provide a round tin box, of the size of a large snuff-box, and likewise eight other boxes, which will go easily into each other, and let the least of them be of a size to hold a shilling. Each of these boxes should shut with a hinge, and to the least of them there must be a small lock, fastened with a spring, but which cannot be opened without a key ; and observe, that all these boxes must shut so freely, that they may all be closed at once. Place these boxes in each other, with their tops open, in your pocket : then ask a person for a shilling, and desire him to mark it, that it may not be changed : take this piece in one hand, and in the other have another of the same appearance, and, putting your hand in your pocket, you slip the piece that is marked into the least box, and, shutting them all at once, you take them out : then, showing the piece you have in your hand, and which the company suppose to be the same that was marked, you pretend to make it pass through the box, but dexterously convey it away. You then present the box, for the spectators do not know yet that there are more than one, to any person in company, who, when he opens it, finds another, and another, till he come to the last, but that he cannot open without the key, which you then give him ; and, retiring to a distant part of the room, you tell him to take out the shilling himself and see if it be the one marked. This trick may be made more surprising by putting the key into the snuff-box of one of the company ; which you may do by asking for a pinch of snuff ; the key, being very small, will be concealed among the snuff : when the person, who opens the box, asks for the key, tell him that one of his friends has it in his snuff-box.

THE MONEY BOX.

A piece of money, or a ring, is put into a box, in the presence of a person who holds it ; the operator stands at a distance, and bids him shake the box gently, and the piece is heard to rattle inside ; he is desired again to shake

Q



t, and then it is not heard to rattle ; the third time, it is again heard, but the fourth time it is gone, and is found in the shoe of one of the company.

The box must be made on purpose, in such a manner that, in shaking it gently up and down, the piece within is heard ; on the contrary, shaking it hard, horizontally, a little spring, which falls on the piece, prevents it from being heard, which makes you imagine it is not within. He who performs the trick, then touches the box, under pretence of showing how to shake it, and, although it is locked, he easily gets out the piece by means of a secret opening, availing himself of that minute to put in a false piece, and to leave the box with the same person, whom he causes to believe that the piece is or is not within, according to the manner the box is shaken : at length, the original piece is found in the shoe of one of the company, either by means of the person being in confederacy, and having a similar piece, or by sending another to slip it on the floor : in this last case, it is found on the floor, and the person fixed on is persuaded that it fell from his shoe as he was taking it off.

THE SALAMANDER.

An experiment to ascertain the degree of heat it is possible for a man to bear, was made in the month of July, 1828, at the New Tivoli, at Paris, in the presence of a company of about two hundred persons, amongst whom were many professors, *savans*, and physiologists, who had been especially invited to attend, by the physician Robertson, director of that establishment. The man on whom this experiment was made was a Spaniard of Andalusia, named Martenez, aged forty-three. A cylindrical oven, constructed in the shape of a dome, had been heated, for four hours, by a very powerful fire. At ten minutes past eight, the Spaniard, having on large pantaloons of red flannel, a thick cloak, also of flannel, and a large felt, after the fashion of a straw hat, went into the oven, where he remained, seated on a foot-stool, during fourteen minutes, exposed to a heat of from forty-five to fifty degrees of a metallic thermometer, the gradation of which did not go higher than fifty. He sang a Spanish song while a fowl was roasted by his side. At his coming out of the oven, the physicians found that his pulse beat one hundred and thirty-four pulsations a minute, though it was but seventy-two a his going in. The oven being heated anew for a second experiment, the Spaniard re-entered and seated himself in the same attitude, at three-quarters past eight, eat the fowl and drank a bottle of wine to the health of the spectators. At coming out his pulse was a hundred and seventy-six, and indicated a heat of one hundred and ten degrees of Reaumur. Finally, for the third and last experiment, which almost immediately followed the second, he was stretched on a plank, surrounded with lighted candles, and thus put into the oven, the mouth of which was this time closed : he was there nearly five minutes, when all the spectators cried out " Enough, enough ! " and



anxiously hastened to take him out. A noxious and suffocating vapor of tallow filled the inside of the oven, and all the candles were extinguished and melted. The Spaniard, whose pulse was two hundred at coming out of this gulf of heat, immediately threw himself into a cold bath, and, in two or three minutes after, was on his feet, safe and sound.

About the year 1809, one Lionetto, also a Spaniard, astonished not only the ignorant, but chemists and other men of science, in France, Germany, Italy, and England, by his insensibility to the power of fire. He handled, with impunity, red hot iron and molten lead, drank boiling oil, and performed other feats equally miraculous. While he was at Naples, he attracted the notice of Professor Sementeni, who narrowly watched all his operations, and endeavoured to discover his secret. He observed, in the first place, that when Lionetto applied a piece of red hot iron to his hair, dense fumes immediately rose from it; that when he touched his foot with the iron, similar vapors ascended, which affected both the organs of sight and smell. He also saw him place a rod of iron, nearly red hot, between his teeth, without burning himself; drink the third of a table-spoonful of boiling oil; and taking up molten lead with his fingers, place it on his tongue without apparent inconvenience.

Anxious to discover the means used by Lionetto to render himself capable of thus enduring the application of heat, Sementeni performed several experiments upon himself, and made many important discoveries. He found, that by friction with sulphuric acid diluted with water, the skin might be made insensible to the action of the heat of red-hot iron: a solution of alum, evaporated until it became spongy, appeared to be more effectual in these frictions. After having rubbed the parts, which were thus rendered, in some degree, incombustible, with hard soap, he discovered, on the application of hot iron, that their insensibility was increased. He then determined on again rubbing the parts with soap, and after this, found that the hot iron not only occasioned no pain, but that it actually did not burn the hair. Being thus far satisfied, the Professor applied hard soap to his tongue, until it became insensible to the heat of the iron; and after having placed an ointment, composed of soap mixed with a solution of alum, upon it, boiling oil did not burn it: while the oil remained on the tongue a slight hissing was heard, similar to that of hot iron when thrust into water; the oil soon cooled, and might then be swallowed without danger.

These are stated to be the results of the experiments performed by Pro-



served that, in order to show its high temperature, he threw pieces of lead into it, which, in the process of melting, absorbed a quantity of the caloric, or heat, of the oil; and that the small quantity of the latter which he poured upon his tongue, already prepared to receive it in the manner we have stated, cooled before he swallowed it. It is clear that he might put the molten lead upon his tongue with impunity, and suffer even less inconvenience from it, if possible, than from the oil, by the greater heat of which it had been melted. It is, however, probable, that instead of lead, Lionetto used a more fusible mixture; such, for instance, as that which will presently be found described under the title of "The Magic Spoon."

Several scientific men have successfully repeated the experiments of Professor Sementeni; and it is now no longer considered miraculous to behold a man applying hot iron to his skin without suffering from its powers. But we beg to caution our young readers very seriously against making any similar experiments upon themselves: they are only fit for men of science and profound chemical knowledge, and the least inaccuracy or omission would be productive of serious consequences. The foregoing account of the performances of the Fire-eaters and their secrets, we insert for the information of our young friends only, without holding them up as experiments calculated for their capacities or fit for their performance. If, in the course of this work, we should think fit to relate the mode of constructing wings to fly from St. Paul's to the monument, or even across the Hellespont, it by no means follows that the boys of England, for whose instruction and amusement we are, at this moment, "wasting the midnight oil," should make the attempt. The French author to whom we are indebted for the foregoing particulars,—Monsieur Julia Fontenelle, President de la Société Linnéenne et des Sciences Physiques et Chimiques de Paris; Membre honoraire de la Société Royale de Varsovie; de l'Académie Royale de Médecine, et de celle des Sciences de Barcelonne; de la Société Royale Académique des Sciences de Paris, et cætera—(we like to give a clever man his titles in full)—states that, when the Spaniard, Lionetto, undertook the experiments which we have above described, he was under apprehensions of having something to do with the Inquisition, in consequence of his exploits

TO MELT TWO METALLIC MIXTURES BY FRICTION.

Melt in one vessel, one part of mercury and two parts of bismuth; and in another, one part of mercury and four of lead; when cold, they will be quite solid: by rubbing them against each other, they will soon melt, as though each were rubbed separately against red hot iron.

THE HANDKERCHIEF HEARTH.

Cover the metal case of a watch with part of a handkerchief, single only, bring the ends to that side where the glass is, and hold the handkerchief by



them there, so as to stretch it tightly over the metal. You may then place a red hot coal, or piece of lighted paper, upon that part of the handkerchief which is so strained over the metal, without burning it; the caloric merely passing through the handkerchief to fix in the metal.

THE INCOMBUSTIBLE THREAD.

Wind some linen thread tightly round a smooth pebble, secure the end, and if you expose it to the flame of a lamp or candle it will not burn. The caloric traverses, without fixing in it, and only attacks the stone which it encases.

Asbestos, a species of stone thread, can be held in the flame of a lamp, without being wound round a pebble, and will be equally incombustible.

SIMPLE AMALGAMATION AND SEPARATION.

Place a globule of mercury, about the size of a pea, on a piece of paper, by the side of a globule of potassium, about half the size of the mercury; fold up the paper so as to bring them into contact with each other; some caloric will be immediately disengaged, and the amalgamation will be complete in a few seconds. If it be then thrown into water, the mercury will be disengaged and fall to the bottom; the potassium, on the contrary, will decompose the water, absorb the oxygen, and the hydrogen being set at liberty, will discharge itself with some noise. The potassium will be converted into deutoxide of potassium, or potass, and dissolve in the water.

HIDEOUS METAMORPHOSIS.

Take a few nut-galls, bruise them to a very fine powder, which strew nicely upon a towel; then put a little brown copperas into a basin of water; this will soon dissolve, and leave the water perfectly transparent. After any person has washed in this water, and wiped with the towel on which the galls have been strewed, his hands and face will immediately become black; but, in a few days, by washing with soap, they will again become clean. This trick is too mischievous for performance.

TO MAKE A WET STONE PRODUCE FIRE.

Take quick-lime, salt-petre, tutia-Alexandrina and calamine, (*lupis calaminaris*,) of each, equal parts; live sulphur and camphor, of each, two parts: beat and sift them through a fine sieve; then put the powder into a



THE SUB AQUOUS VOLCANO.

Take one ounce of saltpetre ; three ounces of powder ; of sulphurivum, three ounces ; beat, sift, and mix them well together ; fill a pasteboard, or paper mould, with the composition, and it will burn under the water til quite spent. Few persons will believe that this can be done before they have seen it tried.

THE CHEMICAL SAMSON.

To melt a rod of iron with a common fire. Heat a rod of iron, as thick as your finger, in a fire, urged by a pair of bellows, until it is white hot ; draw it from the fire, and apply to the hot part a roll of brimstone, held by a pair of tongs ; a profusion of most brilliant sparks will be thrown out, and the iron drop like melting sealing-wax. It is necessary to hold it over the hearth, to avoid mischief. If the heated part be a few inches from the end of the bar, a piece of it will be cut off.

THE MAGIC SPOON.

Put four ounces of bismuth into a crucible, and when in a state of complete fusion, throw in two ounces and a half of lead, and one ounce and a half of tin ; these metals will combine, and form an alloy fusible in boiling water. Mould the alloy into bars, and take them to a silversmith to be made into tea-spoons. Place one of them in a saucer, at a tea-table, and the person who uses it will not be a little astonished to find it melt away as soon as he puts it into the hot tea.

METAL MELTED ON PAPER OVER A CANDLE.

An alloy, which may be kept in a state of fusion by placing it upon a piece of paper and holding it over a candle, may be made by melting together equal parts of bismuth, lead, and zinc.

THE WONDERFUL DYE.

Dissolve indigo in diluted sulphuric acid, and add to it an equal quantity of solution of carbonate of potass. If a piece of white cloth be dipped in this mixture, it will be changed to blue ; yellow cloth, in the same mixture, may be changed to green ; red to purple ; and blue litmus paper be turned to red.

METALLIC TRANSMUTATION.

Dip a piece of polished iron, the blade of a knife, for instance, into a solution either of nitrate or sulphate of copper, and it will assume the appearance of a piece of pure copper ; this is occasioned by the sulphuric acid seizing on the iron, and letting fall the copper.

**THE FADED ROSE RESTORED.**

Take a rose that is quite faded, and throw some sulphur on a chafing-dish of hot coals, then hold the rose over the fumes of the sulphur, and it will become quite white; in this state dip it into water, put it into a box or drawer for three or four hours, and when taken out, it will be quite red again.

THE PROTEAN LIQUID.

To make a red liquor, which, when poured into different glasses, will become yellow, blue, black, and violet. This phenomenon may be produced by the following process:—Infuse a few shavings of log-wood in common water, and when the liquor is red, pour it into a bottle; then take three drinking glasses; rinse one of them with strong vinegar, throw into the second a small quantity of pounded alum, which will not be observed if the glass has been newly washed, and leave the third without any preparation. If the red liquor in the bottle be poured into the first glass, it will assume a straw color, somewhat similar to that of Madeira wine; if into the second, it will pass gradually from bluish gray to black, provided it be stirred with a bit of iron, which has been privately immersed in good vinegar: in the third glass, the red liquor will assume a violet tint.

INCOMBUSTIBLE PAPER.

Dip a sheet of paper in strong alum-water, and when dry, repeat the process; or, it will be better still, if you dip and dry it a third time. After this, you may put it in the flame of a candle, and it will not burn.

THE MIMIC CONFLAGRATION.

Take half an ounce of sal-ammoniac, one ounce of camphor, and two ounces of aqua-vitæ; put them into an iron pot, narrowing towards the top, and set fire to it. The effect will be immediate; a mimic conflagration will take place, which will be alarming, but not dangerous.

PORTRAITS VISIBLE AND INVISIBLE.



about two hours; pour off the solution, and put it into a phial an inch wide, with a large mouth, with a lump of lapis calaminaris; then stop it close, and the calamine stone will keep in perpetual motion.

THE DANCING EGG.

Boil an egg hard, and peel off a small piece of the shell at one end; then thrust in a quill filled with quicksilver, and sealed at each end. As long as the egg remains warm, it will not cease to dance about.

THE EGG IN THE PHIAL

You may make an egg enter a phial without breaking, by steeping it in strong vinegar, for some time; the vinegar will so soften the shell, that it will bend and extend lengthways without breaking; when put in cold water, it will resume its former figure and hardness.

THE BLUE BOTTLE.

Expose an ounce of volatile alkali to the air, in a glass, for about a quarter of an hour; then put it into a flask, with twenty-four grains of the sulphate of copper, and the liquid will, by degrees, assume a beautiful blue color; pour it carefully into another flask, so as to separate the liquid from the copper. If you examine it a few days afterward, you will find that the blue color has totally disappeared; but, if you take out the cork for a minute, and replace it, you may see the blue re-appear on the surface of the liquid, and descend gradually, until the whole of it is of the same hue as it was when you laid it aside. In a few days, it will again become colorless, and you can restore the blue by the same simple means. The experiment may be performed a great number of times with the same liquid. Care must be taken in making your preparation, that the volatile alkali be not suffered to remain long enough in the first flask, to dissolve too much of the sulphate of copper; for, if it receive too great a degree of color, the blue will not disappear, when the liquid is deprived of air.

THE CANDLE OF ICE.

Cover a small portion of the upper end of a tallow candle with paper, and give the remainder of it a coat of fine coal and powdered sulphur, mixed together; dip it in water, and expose it to the air during a hard frost, and a slight coat of ice will form round it, which may be, subsequently, rendered thicker, in proportion to the number of immersions and exposures to the air which it receives. When it arrives at a sufficient consistency, take off the paper, light the upper end of the candle, and it will burn freely.



LEGERDEMAIN

181

TO DIP THE HAND IN WATER WITHOUT WETTING IT.

Powder the surface of a bowl of water with lycopodium; you may then put your hand into it, and take out a piece of money, that had been previously placed at the bottom of the bowl, without wetting your skin; the lycopodium so attaching itself to the latter, as to keep it entirely from coming in direct contact with the water. After performing the experiment, a slight shake of the hand will rid it of the powder.

TO REMOVE AND AFTERWARDS RESTORE THE COLOR OF A RIBBON.

Dip a rose-colored ribbon into nitric acid, diluted with eight or ten parts of water, and as soon as the color disappears, which it will do in a short time, take out the ribbon, and put it into a very weak alkaline solution; the alkali will quickly neutralize the acid, and the color will then re-appear.

THE PAPER ORACLE.

Some amusement may be obtained among young people, by writing, with common ink, a variety of questions, on different bits of paper, and adding a pertinent reply to each, written with nitro-muriate of gold. The collection is suffered to dry, and put aside until an opportunity offers for using them. When produced, the answers will be invisible; you desire different persons to select such questions as they may fancy, and take them home with them; you then promise, that if they are placed near the fire, during the night, answers will appear written beneath the questions in the morning; and such will be the fact, if the papers be put in any dry, warm situation.

THE SIBYL'S CAVE.

Write several questions and answers, as directed in the preceding article: for the answers, instead of nitro-muriate of gold, you may use the juice of a citron, or an onion. Let any of the questions be chosen by a party, and placed in a box, which may be called "The Sibyl's Cave." This box



placed in it, the other end of which is carried into another vessel : the oil, obedient to the laws of capillarity, will rise gradually into the cotton, and fall, drop by drop, from the other extremity of it, into the vase or cup, which is placed to receive it. We are told, that the process is much quicker, if the cotton be previously dipped in oil.

TO MAKE A COLORLESS LIQUID BECOME BLUE, LILAC, PEACH-COLORED, AND RED WITHOUT TOUCHING IT.

Put a drachm of powdered nitrate of cobalt into a phial, containing an ounce of the solution of caustic potass : a decomposition of the salt, and precipitation of a blue oxide of cobalt, takes place. Cork the phial, and the liquid will now assume a blue color, from which it will pass to a lilac, afterward to a peach tint, and, finally, to a light red.

THE FOUR ELEMENTS.

Procure a glass tube, about the thickness of a man's finger, and securely seal one end of it. Mark it, all round, with four equal divisions. Introduce mercury, sufficient to fill the space below the first mark ; a solution of sub-carbonate of potass for the second division ; white brandy, to which a blue tint is imparted, for the third ; and turpentine, colored red, for the fourth. After these preparations are completed, close up and seal the mouth of the tube, and you may then give a fanciful exhibition of chaos and the four elements. Shake the tube, and you will mix all the contents together, and this mixture will represent chaos ; in a short time, if the tube be not removed all the ingredients will separate, and each go to its allotted division, placing itself according to its specific gravity, in comparison with the others : the contents of the upper division, which is red, will represent fire ; the next, which has a blue tint, air ; the third, which is colorless, water ; and the lower one, earth.

THE MINERAL CHAMELEON.

We are indebted to Shæpe for a composition, known by the above title.



water, will produce a beautiful green color, which will pass with rapidity to a dark purple, and, subsequently, to red. If a small portion of the Chameleon Mineral be used for four ounces of water, the color will be a deep green; by the addition of more water, it will turn rosy, and become colorless in a few hours, giving in the process a yellowish precipitate. When the liquid changes slowly, it is easy to discover other hues, which it takes in the following order—green, blue, violet, indigo, purple and red.

It appears that the phenomena produced by the Chameleon Mineral, have attracted the attention of several men of science, and it seems, from the result of their experiments, that in those preparations of the Chameleon Mineral, in which there is a greater proportion of potash than manganese, the green requires more time to change into the other colors, and the greater the proportion of manganese, the more intense is the first color, and the quicker does the liquid acquire the other tints. The effect of hot water in this experiment, is much more powerful than that of cold.

PHOSPHORIC FISH, METEORS, &c.

Phosphorus was discovered by the alchemist Brandt, who sold the secret to Krafft, with whom Kunkel associated himself for its purchase. He was, however, deceived by Krafft, who never communicated the secret to him. Kunkel immediately commenced a series of experiments, and in 1674, discovered the mode of making it.

Phosphorus, in a state of purity, is solid, demi-transparent, and of a consistence similar to wax; the solar light gives it a red color; it will unite with almost all metallic substances. When it is taken in the hand, it should never be held for more than a few seconds, for the heat thus applied, is sufficient to inflame it, if continued; and a burn from phosphorus is more painful than any other kind of burn. A basin of cold water ought always to be at hand, to dip the phosphorus in occasionally; and when it is cut to pieces, it must be cut in water. Phosphorus can only be preserved by keeping it in places where neither light nor heat has access. It is obtained from druggists in rolls, about the thickness of a quill: these are put into a phial filled with



luminous property. In 1642, an old woman presented the Prince of Condé with some meat, bought by her the preceding day in the market of Montpellier, and which illuminated her room during the night. We have seen a solo emit most brilliant and beautiful flashes of light on a dark night.

A great number of experiments have been performed by scientific men, to ascertain the cause of the luminous aspect of the sea; it is attributed to those putrid substances, which are found in the waters. The following experiment, which has reference to this subject, is rather curious:—A little fresh whiting was placed in a vase containing water. It produced no light, even after having been agitated; that part of the fish only that was above the water, and not the water itself, grew luminous during the night. On lifting up the fish, by means of a stick, which was passed beneath it, and rested against the opposite side of the vase, the water appeared luminous behind it; on being much agitated, it became entirely luminous, and continued so for some time after it was left undisturbed. The strongest emission of light takes place after the fish has been about twenty hours in the water; after three days, the water loses this property. About four drachms of the substance of a fresh herring were put into a solution of two drachms of sulphate of magnesia, in two ounces of water. On the succeeding evening, the whole of the liquor, upon shaking the phial, became beautifully luminous, and it continued luminous till the fourth day.

There is a fish mentioned by Pliny, the naturalist, which renders such objects luminous as are touched by it. It differs from its fellow tenants of the waters, which become phosphorescent only when in a state of putrefaction; whereas, the fresher the pholis is, the more luminous does it appear. Brandy extinguishes its light; when it becomes dry, a little pure or salt water will revivify its lustre. When putrid, it loses its brilliancy, which it does not recover until putrefaction has gone its full length, when, by agitating it in water, the latter becomes luminous. Solutions of hydrochlorate of soda and nitrate of potass, augment the brilliancy of the water; acids and wine extinguish it. The water may be rendered still brighter by pouring it on recently calcined sulphate of lime, on quartz, sugar, &c.

The phosphoric meteors, commonly called Will-o'-wisp, which are seen in marshes, near rivers, in churchyards, and in low and humid places, in different forms, are to be attributed to the combustion of some hydrogen gas, principally phosphoric hydrogen gas, which, as is well known, has the property of inflaming itself on coming into contact with oxygen gas or air. These meteors are more frequently seen in winter than in summer; in rainy weather their light is more intense than when it is dry.

PHOSPHORIC WOOD.

Rotten wood often becomes luminous; many circumstances induce us to ascribe its light to slow combustion; a fact in favor of this idea is, that if



phosphorescent wood be placed in a pneumatic machine, and the air be pumped out of it, the light disappears, and if the air be restored, the wood again becomes luminous. The same experiments performed with a fish that emitted light, produced the same results. The light of fish differs from that of rotten wood in this respect,—namely, that water, alcohol, and several saline solutions, destroy the light of the latter; while water does not diminish the brilliancy of the former, no more than it does that of the glow-worm. If luminous wood be introduced to a tube of glass, and plunged into a freezing mixture, the light will be extinguished.

Rods of wood may be rendered phosphorescent, by steeping them in a solution of chlorate of lime, and then burning one of their ends in the flame of a lamp or candle; after the combustion has taken place, if the stick be withdrawn, a little white matter will be found at the extremity, which will shed a brilliant light. The harder kinds of wood are most proper for this experiment. The white remains of the combustion, it is said, are pure lime; and that a similar luminous property might be given to the wood, by plunging it into lime-water, or a solution of sulphate of magnesia.

PHOSPHORIC PLANTS.

Persons working in mines sometimes meet with phosphorescent plants, the light is perceptible at the points of the plants, especially when they are broken. This phosphorescence disappears in an atmosphere of hydrogen gas, of chlora, or oxide of carbon.

The daughter of the celebrated Linnæus discovered that the *tropeolum majus* is sometimes phosphorescent in the evening.

PHOSPHORIC OYSTER SHELLS.

Place some very thick oyster shells upon, and cover them with, some burning coals; in half an hour take them carefully out of the fire, and it will be only necessary to expose them to the light for a few minutes to be con-



TO RENDER MILK LUMINOUS.

Milk may be rendered luminous by immersing a pholas in it. One of these fishes is sufficient to communicate light to seven ounces of milk, which as it becomes luminous, appears also to be turned transparent. Beccaria felt convinced that air was necessary for the production of this light: for, having filled a tube with milk made luminous in the foregoing manner, he could only disengage the light from it by suffering the admission of air to the tube. The juice of this fish, reduced into a paste with meal, throws out considerable light when plunged into hot water. If preserved in honey, the fish will retain its luminous property for more than a year; and, in fact, by plunging it into hot water, it will shed as much light as if it were quite fresh.

IGNITION BY COMPRESSION.

By compressing a bit of phosphorus between two pieces of wood, it will inflame. The same effect may be produced by the friction of one piece of phosphorus against another.

THE MASK OF FLAME.

Take six parts of oil of olives and one of phosphorus, suffer them to digest well together, and preserve the solution, which, in the dark, will become uminous. An experiment that is considered amusing may be performed by closing the eyes and lightly passing a sponge, dipped in this solution, over the face and hands, which will then, in the dark, appear covered with a light bluish flame. This trick, we are told, is not at all dangerous.

THE MINIATURE RIVER ON FIRE.

Let fall a few drops of phosphorized ether on a lump of loaf sugar, place the sugar in a glass of warm water, and a very beautiful appearance will be instantly exhibited; the effect will be increased, if the surface of the water by blowing gently with the breath, be made to undulate.

PHOSPHORESCENT SPAR.

Coarsely powder some fluor spar, and sprinkle it, in a dark room, on a fire-shovel made hot, (but not to redness,) and it will emit a beautiful phosphorescent light for some time.

IGNITION BY PERCUSSION.

Put into the middle of some dry cotton, a piece of phosphorus the size of a large pin's head, previously dried on blotting paper; strike it with a hammer and it will inflame.

**THE PHOSPHORIC STEAM BATH.**

Lay a small piece of phosphorus upon a bit of glass, place the glass upon the surface of hot water in a basin, and the phosphorus will inflame.

TO BURN BROWN PAPER BY PHOSPHORUS AND FRICTION.

Wrap a grain of phosphorus, dried on blotting paper, in a piece of brown paper, rub it with some hard body, and it will set fire to the paper.

THE ILLUMINATOR AND EXTINGUISHER.

Make two little figures of wood or clay, or any other materials you please, with a little hole in the mouth of each. Put in the mouth of one, a few grains of bruised gunpowder, and a little bit of phosphorus in the other. Then take a lighted wax candle, and present it to the mouth of the figure with the gunpowder, which, taking fire, will put the candle out; then present your candle, having the snuff quite hot, to the other figure, and it will light again immediately.

TO LIGHT A CANDLE BY A GLASS OF WATER.

Take a little piece of phosphorus, of the size of a pin's head, and with a piece of tallow, stick it on the edge of a drinking-glass. Then take a lighted candle, and having blown it out, apply it to the glass, when it will immediately be lighted. You may likewise write, with a bit of phosphorus, on paper, some words, which will appear awful, when the candle is withdrawn from the room.

AUTOMATA.

OUR object being to acquaint our young readers with the mode of performing many pieces of astonishing deception, as well as to instruct them how to do several pleasant tricks of a more simple nature, the most celebrated Automata occur to us as being subjects which ought to occupy a conspicuous station in our FEATS OF LEGERDEMAIN.

THE CHESS PLAYER.



facilities than is sufficient to accomplish matters of greater importance. **Th** such a machine really was made, the public had ocular demonstration. The inventor came over to Britain in 1785, and exhibited his automaton to public inspection for more than a year. On his death, it was purchased by M. Maelzel, who paid this country a visit in 1827, when the invention created as much wonder as ever, notwithstanding the vast progress made in mechanical science.

The room where it was exhibited had an inner apartment, within which appeared the figure of a Turk, as large as life, dressed after the Turkish fashion, sitting behind a chest of three feet and a half in length, two feet in breadth, and two feet and a half in height, to which it was attached by the wooden seat on which it sat. The chest was placed upon four castors, which, together with the figure, might be moved to any part of the room.

On the plain surface formed by the top of the chest, in the centre, was raised an immovable chess-board, of handsome dimensions, upon which the figure had its eyes fixed, its right arm and hand being extended on the chess, and its left arm somewhat raised, as if in the attitude of holding a Turkish pipe, which was originally placed in its right hand.

The exhibitor proceeded by wheeling the chest to the entrance of the apartment within which it stood, in front of the spectators. He then opened certain doors contrived in the chest, two in the front and two in the back, at the same time pulling out a long shallow drawer, made to contain the Chessmen, a cushion for the arm of the figure to rest upon, and some counters; two lesser drawers and a green cloth screen, contrived in the body of the figure and its lower parts, were likewise opened, and the Turkish robe which covered them was raised; so that the construction, both of the figure and chest, intentionally was displayed, and the exhibitor introduced a lighted candle into the body of the chest and figure, by which the interior of each was, in a great measure, rendered transparent.

The chest was divided by a partition into two equal chambers; that to the right of the figure was the narrowest, and occupied scarcely one third of the body of the chest; it was filled with little wheels, levers, cylinders, and other machinery used in clock-work: that to the left contained two wheels, some small barrels with springs, and two quarters of a circle, placed



the right hand being constantly fixed on the chest. This slight incongruity proceeded from inadvertence of the inventor, who did not discover his mistake until the machinery was too far completed to remedy the defect. At the commencement of a game, the automaton made a motion of the head, as if taking a view of the board; the same motion occurred at the close of the game. In making a move it slowly raised its left arm from the cushion placed under it, and directed it toward the square of the piece to be moved. The arm then returned to its position on the cushion. Its hand and fingers opened on touching the piece, which it took up and conveyed to any proposed square. The motions were performed with perfect correctness, and the anxiety with which the arm acted, especially in the delicate operation of castling, seemed to be the result of spontaneous feeling; bending at the shoulder, elbow, and knuckles, and cautiously avoiding to touch any other piece than that which had been moved.

On giving check to the king, it moved its head as a signal. When a false move was made by its antagonist, which frequently occurred through curiosity to observe in what manner the automaton would act,—as for instance, if a knight had been moved like a castle,—the automaton smote impatiently on the chest with its right hand, replaced the knight in its former square, and would not permit its antagonist to recover his move, but proceeded immediately to move one of its own pieces, thus appearing to punish him for his inattention.

It was considered of importance that the person matched against the automaton should be attentive in moving a piece exactly in the centre of a square; otherwise, the figure, in attempting to lay hold of the piece, might even sustain some injury in the delicate mechanism of the fingers. If its antagonist hesitated for a considerable time to move a piece, it tapped smartly on the chest with its right hand, as if testifying impatience at the delay.

During the time the automaton was in motion, a low sound of clock work was heard, as if running down, which ceased soon after the arm was reclined on the cushion. The works were wound up at intervals of ten or twelve



himself, on which he copied the automaton's moves, and made his own; while a person who attended at the automaton's board, copied, with due precision, for the automaton, the adversary's moves.

In concluding our account of this extraordinary machine, we must observe that it has been asserted, without contradiction, that, although it beat numerous skilful chess players, in different countries, its moves were directed by a boy concealed within the machinery; so that, in fact, whoever the boy could beat at the game, was sure to be conquered by the automaton. This will show that it is in the power of youth to attain such a mastery over chess, as to render them capable of competing with capital players of a mature age.

THE FLUTE PLAYER.

The celebrated Vaucanson invented an Automaton Flute-player, of which there is a minute description in the Memoirs of the Royal Academy of Sciences at Paris, by which it appears that the figure was about five feet and a half high, and was placed upon a square pedestal, which concealed a portion of the machinery. The air entered the body by three separate pipes, into which it was conveyed by nine pairs of bellows, which expanded and contracted in regular succession, by means of a steel axis turned by clock-work. These bellows performed their functions without any noise, which might have discovered the means of conveying the air into the machine. The three tubes that received the air from the bellows passed into three small reservoirs in the trunk of the figure, where they united, and ascending towards the throat, formed the cavity of the mouth, which terminated in two small lips. Within this cavity was a small movable tongue, which, by its motion, at proper intervals, admitted the air or intercepted it in its passage to the flute. The fingers, lips, and tongue, derived their appropriate movements from a steel cylinder, also turned by clock-work. It was divided into fifteen equal parts, which, by means of pegs pressing



LEGERDEMAIN.

191

and the fourth pushed them forward : the lips were projected upon that part of the flute which received the air, and by the different motions already mentioned, properly modified the tune. The remaining lever was employed in the direction of the tongue, which it easily moved, so as to open or shut the mouth of the flute. The just succession of the several motions performed by the various parts of the machine, was regulated by the following simple contrivance :—the extremity of the axis of the cylinder terminated, on the right side, by an endless screw, consisting of twelve threads, each placed at the distance of an eighth of an inch from the other. Above the screw was fixed a piece of copper, and in it a steel pivot, which falling in between the threads of the screw, obliged the cylinder to follow those threads ; and thus, instead of turning directly round, it was continually pushed on one side. Hence, if a lever were moved by a peg placed on the cylinder, in any one revolution, it could not be moved by the same peg in the succeeding revolution because the peg would be an eighth of an inch beyond it, by the lateral motion of the cylinder. Thus, by an artificial disposition of these pegs in different parts of the cylinder, the statue was made, by the successive elevation of the proper levers, to exhibit all the different motions of a flute-player.

THE INVISIBLE GIRL.

The operators have a communication, from the exhibition room to another where the confederate is concealed, by tin pipes, which end in a clear horn trumpet, inserted in an isolated glass chest or barrel, attached to the ceiling by colored ribbons, twined round a small gilt chain. In the inside of these pipes, at right angles, are placed small mirrors, which reflect and contract every object in the exhibition room, so that the confederate, who answers the questions put, can not only hear all that is said, but see even the objects that are held in the hands of the visitors, such as watches, money, miniatures, letters in a book, and every other thing that is uncovered. The following curious dialogue took place between a traveller from this country, and the Invisible Girl, at Siccard's Diversion Room, in Paris :—"What age are you ? Fourteen years of age. Where were you born ? At Marseilles. What is your name ? Françoise. Are you pretty ? No. Are you good ? Yes, though sometimes ill-natured. What is your opinion ? I am opinionless. Do not ask all the questions that are put to you



THE MAHOMETAN MAGICIAN.

The following description of the mechanical conjuring figure, so called as well as that of "The wise little Turk," will, doubtless, remind our readers of the Automaton Chess-player.

The Mahometan Magician is a figure of sixteen or eighteen inches high and holds a little hammer in its hand. When exhibited, it is first taken off the table on which it stands, and shown to the company, to convince them that it is perfectly detached, and stands by itself: the exhibitor then having replaced it on the table, asks if he will compliment his master? The little Turk, by turning his head, expresses "No." He then asks if he will pay his respects to the company? He bows his head to express "Yes." A pack of cards is then presented to the spectators, who draw out one by chance; without seeing the card, or approaching the automaton, his master orders him to strike the number of strokes, necessary to describe the card, with his hammer, on a bell:—the little Turk instantly obeys. He is then asked if the card drawn is a heart, a diamond, club, or spade? And, as the suits are mentioned, he moves his head, to give approbation or disapprobation, and an answer conformably to truth. He then tells the number thrown on dice; and also, before-hand, the number which a second throw will produce. One of the company having hid a little figure in a box, divided into several compartments, he tells in which of them, and at what number, the little figure is to be found; and, to give a humorous termination to this trick, when he is asked which of the company is the most humorous he points out some old gentleman with spectacles.

The table on which the little Turk is placed, is covered with a green cloth, concealing three levers, which are put in motion by the aid of three brass wires, passing through the feet of the table, and conducted behind the partition: the person who is hid, and acts as the confederate, draws these brass wires as he has occasion to act on the cranks concealed in the pedestal of the automaton, which cranks terminate in the base. By these means, the different motions are communicated to the machine the moment they are required, in the same manner as a repeating watch is made to strike by pushing the button of the case. The performer then holds in his hand a pack of cards, arranged in such a manner that he understands their sequence; that the spectators may not suspect this arrangement of the cards, he apparently mixes them, but, in reality, he only cuts them, which does not change the combination of the game; when he has had a card drawn, he cuts them the last time in the place where the card has been chosen, by which means, he passes to the bottom the card which was immediately over the one drawn: then, looking adroitly at the bottom, he knows, without seeing, the card which the spectator had drawn by chance. He then interrogates the little Turk by a question, which is so composed, that either



LEGERDEMAIN.

193

the words, syllables, or vowels, communicate to the confederate the color and denomination of the card. By a similar stratagem, knowledge is conveyed to the confederate of the first number thrown on dice; the automaton can then very easily tell what number will come up on the second throw of the dice, because fresh dice are introduced, and such are substituted as have the same numbers on all their faces. As the person, to whom the dice are given, might, by looking at them, perceive the imposition, to escape detection, peculiar care is taken not only to recommend to him to hold the dice carefully hidden in his hand until he throws them, but also to prevent them being too long exposed to the sight; loaded dice might also be employed, which are so contrived, that the centre of gravity operates invariably. As the person who has already thrown the dice may wish to throw again, either accidentally or through suspicion, and as the return of the same points might occasion the honesty of the dice to be suspected, all these inconveniences are removed by getting rid of them as soon as possible.

The box where the little figure has been concealed has a bottom of soft leather, by which means, in handling beneath the compartment where the little figure is, may be discovered by the hand of the operator; and the figure is constructed of such dimensions as to press on the bottom of the box when it is shut.

THE CANARY

A Canary bird is shown, perched on a bottle, which sings any air required. He also sings equally well when changed to different bottles, and on different tables: the breath from his bill blows out a candle, and lights it afterward. The machinery and manner of working we shall now proceed to describe.

Behind the curtain which covers part of the partition are placed two hollow cones of metal. These cones, which are unequal in size, serve as a speaking trumpet to the confederate, and act as echoes, which conduct the voice to different parts, as two mirrors, of different concavities, operate in the reflection of objects at different distances. The confederate, imitating



that the notes are really formed in the throat of the bird, because the air comes through the bill. When the operator takes the bird in his hand he puts the bellows in motion with his thumb, and the wind in the same manner extinguishes the candle, and he persuades the company that the bird sings without the aid of any machinery hidden in the table; the candle being only a moment extinguished, and the wick still warm, is lighted instantly, by the air through the bill of the bird, which, for that purpose, has been furnished with a little flour of brimstone, and operates as a match.

Besides the curious Automata we have already described, various others have been produced by ingenious persons of different countries. Albertus Magnus is said to have devoted thirty years of his life to the construction of a head that not only moved, but spoke: Thomas Aquinas was, it is related, so terrified at its powers, under the impression that it was the work of magic, that he broke it to pieces. A locksmith of Nuremberg, in the sixteenth century, constructed figures that beat drums, while others played on lutes: and the emperor Charles the Fifth amused himself, in his retirement, by making similar Automata, or rather, Androides, for so such figures are called by the learned. The celebrated John Muller, it is reported, made a wooden eagle, in 14" 0, which, on the emperor Maximilian's approach to Nuremberg, flew to meet him. Vauconson made an Automatic duck, and, as L'abbe tells us, General de Genne's, (who, in 1688, defended St. Christopher against the English,) an Automatic peacock; both of these were of a size and plumage perfectly natural: they eat, drank, walked about, and uttered the same sounds as the birds themselves. The machinery, in both cases, was similar to that of a watch. However astonishing these more complicated pieces of machinery may have been to our forefathers, in modern times, enlightened persons regard Vauconson and his Flute-player, and De Kempelen and his Turk, with much less wonder than that with which the rustics of the present day gaze upon the Jack-pudding Jugglers, who amuse them on a Cart-stage.





TRICKS WITH CARDS.

Among the most amusing feats of Legerdemain are the tricks with cards, of which, in the ensuing pages, we present our reader with an excellent series. Whatever may be the objections, and whether they be well founded or not, against card-playing among youth, it is neither our duty nor inclination to discuss them; it must be admitted, however, that the



Honorable Daines Barrington, however, in his "Observations on the Antiquity of Card-playing in England," asserts, that they came originally from Spain; while other authors attribute their invention to a more classic and ancient era, and give the honor, if it be any, of their first introduction to the Romans. Having given this slight sketch of the history of cards, we shall proceed to furnish the necessary instructions for the performance of the following feats.

FORCING.

Forcing is making a person take such a card as you think fit, while he supposes he is taking one at hazard, or according to his own inclination. It is almost impossible to describe how this is done; we must, however, attempt it. First, ascertain what the card you intend to force is; this must be done privately, or while you are playing with the cards; then place it, to all appearance, carelessly in the pack, but still keep your eye, or the little finger of your left hand, in which you hold the pack, upon it. Now, request a person to take a card from the pack; open them nimbly from your left to your right hand, spreading them backward and forward, so as to puzzle the person in making his choice: the moment you see him putting out his hand to take a card, spread on the cards till you come to the one you wish to force; let its corner be most invitingly put forward in front of the other cards, and let it make its appearance only the moment his fingers reach the pack. This mode of operation seems so fair, that unless he knows the secret of forcing, you may put what card you please into his hand, while he thinks he is making a choice himself. Having thus forced your card, you may tell him to look at it, give him the pack to shuffle as much as he pleases, for, in fact, do what he will, you, of course, can always tell what it was. A method of doing this cleverly is the first thing to be acquired; for without it, few of the master-feats can be performed.

TO TELL A CARD THOUGHT OF BLINDFOLD.

Take twenty-one cards, and lay them down in three rows, with their faces upward; (i. e.) when you have laid out the three, begin again at the left hand, and lay one card upon the first, and so on to the right hand; then begin on the left hand again, and so go on until you have laid out the twenty-one cards in three heaps, at the same time requesting any one to think of a card. When you have laid them out, ask him which heap his card lies in: then lay that heap in the middle between the other two. This done, lay them out again in three heaps as before, and again request him to notice where his noted card goes, and put that heap in the middle as before. Then taking up the cards with their backs toward you, take off the uppermost card, and reckon it once; take off another, which reckon two; and thus proceed till you come to the eleventh, which will invariably prove to be the card thought of.



TRICKS WITH CARDS.

197

You must never lay out your cards less than three times, but as often above that number as you please. This trick may be done without your seeing the cards at all, if you handle and count them carefully. To diversify the trick, you may use a different number of cards, but the number chosen must be divisible by three, and the middle card, after they have been thrice dealt as directed, will always be the one thought of; for instance, if done with fifteen cards, it must be the eighth, and so on; when the number is even it must be the exact half; as, if it be twenty-four, the card thought of will be the twelfth, &c

THE SHUFFLED SEVEN

Desire a person to remember a card and its place in the pack; then, in a dexterous manner, convey a certain number of the cards from the top to the bottom, and subtract them, in your mind, from the number of the pack: for example, the pack consists of fifty-two cards, and you have conveyed seven to the bottom; tell the person the card he has thought of will be the forty-fifth, reckoning from the number of the card, the place of which he has to name: thus, if he say it is the ninth, you go on counting nine, ten, eleven, &c. and the card he thought of will be exactly the forty-fifth, as you announced.

THE PIQUET PACK

Desire some person to choose three cards out of a piquet pack, observing that the ace is to be counted eleven points, the court cards ten, and the other cards according to the counts they mark. When he has made his choice, desire him to lay on the table his three cards, separately, and to put upon each parcel as many cards as are wanted to make up fifteen points; that is to say, if the first card should be nine, he must place six cards; if the second a ten, five cards; and if the third a knave, five cards upon it, this will make nineteen cards employed: consequently there will remain thirteen cards in



comes, inclusively, to the card thought of; offer to go into another room, or to be blindfolded, while he is doing this. Now declare in what order the card shall be in the pack: say, for instance, the twenty-fourth; and, by attending to the following instructions, it will prove to be so: suppose the person, who thinks of the card, stops at thirteen, and that the thirteenth card was the queen of hearts; the number you have stated it shall be in the pack, being twenty-four: you return to the room, in case you had left it, or desire the handkerchief to be removed, if you have been blindfolded; and, without asking any question of the person who has thought of the card, ask only for the pack, and apply it to your nose, as if to smell it; then passing it behind your back, or under the table, take, from the bottom of the pack, twenty-three cards; that is to say, one less than the number you have stated the card thought of shall be; place these twenty-three cards on the top. This being done, return the pack to the person who had thought of the card, requesting him to reckon the cards from the top of the pack, beginning by the number of the card he thought of. His card being the thirteenth, he will be compelled to count fourteen, and you are to stop him when he comes to twenty-three, reminding him that the number you have mentioned is twenty-four, and that, consequently, the twenty-fourth card, which he is going to take up, will be the card thought of; and so it will most certainly be.

THE NOTED CARD NAMED.

Take any number of cards, ten or twelve for instance, bear in mind how many there are, and holding them with their backs toward you, open four or five of the uppermost, and, as you hold them out to view, let any one note a card, and tell you whether it be the first, second, or third, from the top. Now shut up your cards in your hands, and place the rest of the pack upon them; knock their ends and sides upon the table, so that it will seem impossible to find the noted card; yet it may be easily done,—thus: subtract the number of cards you held in your hand from fifty-two, the whole number in the pack, and to the remainder add the number of the noted card, which will give you the number of the noted card from the top.

GATHERING OF THE CLANS.

Have in readiness a pack, all the cards of which are well arranged in



TRICKS WITH CARDS

199

THE MAGIC TWELVE

Let any one take the pack of cards, shuffle, take off the upper card, and, having noticed it, lay it on the table, with its face downward, and out as many cards upon it as will make up twelve with the number of spots on the noted card. For instance: if the card which the person drew was a king, queen, knave, or ten, bid him lay that card with its face downward, calling it ten; upon that card let him lay another, calling it eleven; and upon that, another, calling it twelve; then bid him take off the next uppermost card: suppose it be a nine, let him lay it down on another part of the table, calling it nine; upon it let him lay another, calling it ten; upon the latter another, calling it eleven; and upon that another, calling it twelve: then let him go to the next uppermost card, and so proceed to lay out in heaps, as before, till he has gone through the whole pack. If there be any cards at the last, that is, if there be not enough to make up the last noted card the number twelve, bid him give them to you; then, in order to tell him the number of all the spots contained in all the bottom cards of the heaps, do thus—from the number of heaps subtract four, multiply the remainder by fifteen, and, to the product, add the number of remaining cards, which he gave you; but if there were but four heaps, then those remaining cards alone will show the number of spots on the four bottom cards. You need not see the cards laid out, nor know the number of cards in each heap, it being sufficient to know the number of heaps, and the number of remaining cards, if there be any, and therefore you may perform this feat as well standing in another room, as if you were present.

TO TURN A CARD INTO A BIRD.

Take a card in your hand, and show it fairly to the company, bidding them seriously observe it;—having a live bird in your sleeve—turning your hand suddenly, draw the card into your sleeve with your thumb and little finger, and, giving a shake, the bird will come out of your sleeve into your hand; you may then produce it and let it fly.

TO MAKE A CARD JUMP OUT OF THE PACK.



THE CONFEDERATE WATER-DROP.

Put on your hat, and privately drop a little water, about the size of a crown-piece, upon the table at which you sit; rest your elbows upon the table, so that the cuffs of your sleeves may meet, and your hands stick up to the brim of your hat; in this posture your arms will hide the drop of water from the company; then let any one shuffle the cards, put them into your hands, and set a candle before you, for this trick is only done by candlelight. —then, holding the cards in your left hand, above the brim of your hat, close up to your head, so that the light of the candle may shine upon them, and holding your head down, you will see in the drop of water, as in a looking-glass, all the cards in your hands. Draw the finger of your right hand along each card, as if you were feeling it before you name and lay it down. Thus you may lay down all the cards in the pack, and name them, one by one, without once turning your eyes toward them.

THE FOUR ACCOMPLICES.

Let a person draw four cards from the pack, and tell him to think of one of them. When he returns you the four cards, dexterously place two of them under the pack, and two on the top. Under those at the bottom you place four cards of any sort, and then, taking eight or ten from the bottom cards, you spread them on the table, and ask the person if the card he fixed on be among them. If he say no, you are sure it is one of the two cards on the top. You then pass those two cards to the bottom, and drawing off the lowest of them, you ask if that be not his card. If he again say no, you take that card up, and bid him draw his card from the bottom of the pack. If the person say his card is among those you first drew from the bottom, you must dexterously take up the four cards that you put under them, and placing those on the top, let the other two be the bottom cards of the pack, which draw in the manner before described.

THE NERVE TRICK.

Force a card, and when the person who has taken it puts it in the pack, let him shuffle the cards; then look at them again yourself, find the card and place it at the bottom; cut them in half; give the party that half which contains his card at the bottom, and desire him to hold it between his finger and thumb just at the corner; bid him pinch them as tight as he can; then strike them sharply, and they will all fall to the ground, except the bottom one, which is the card he has chosen. This is a very curious trick, and, if well done, is really astonishing. It is a great improvement of this trick to put the chosen card at the top of the pack, and turn the cards face upward; so that when you strike, the choosing party's card will remain in his hand actually staring him in the face.



TRICKS WITH CARDS

201

THE CHOSEN CARD REVEALED BY A PINCH OF SNUFF.

Force a card, suppose, for instance, the five of clubs, having previously written the words, or drawn the spots, on a clean sheet of paper, with a tallow candle : then hand the pack to the person on whom the card is forced, bid him place it where, and shuffle the pack how, he pleases ; ask for a pinch of snuff, strew it over the sheet of paper, blow the loose grains off, and the remainder will stick to those places which the tallow has touched ; thus telling the person what card he has chosen. The paper, be it observed, if done lightly with the candle, will not appear to have any marks on it. For this trick we are indebted to a celebrated performer of *Legerdemain*, and it is really a most excellent one.

THE DRAWN CARD NAILED TO THE WALL.

Drive a flat-headed and sharp-pointed nail through a card,—force a similar one on any person present,—receive it into the pack,—dexterously drop it, and pick up, unseen, the nailed card ; place the latter at the bottom of the pack, which take in your right hand, and throw it, with the bottom forward, against a wainscoat or door ; the nailed card will be fixed, and the rest, of course, fall to the ground. Take care to place your nail so that the front of the card, when fixed to the door, may be exposed : to effect this, you must also remember to put the back of the card outward, placing it face to face with the others, when you put it at the bottom of the pack.

UPS AND DOWNS.

This is one of the most simple ways, but by no means the less excellent, of ascertaining what card a person chooses. When you are playing with the pack, drop out the diamonds, from the ace to the ten, and contrive, without being perceived, to get all the other cards with their heads in the same direction ; then request a person to choose a card ; do not force one, but let him choose whichever he pleases : while he has it in his hand, and is looking at it, carelessly turn the pack in your hand, so that the position of the cards may be reversed, then bid him put the card he has chosen into the centre



THE TURN-OVER

When you have found a card chosen, which you have previously forced, or any card that has been drawn, and which you have discovered by the means before described, in order to finish your trick cleverly, convey the card, privately, in the top of the pack; get all the other cards even with each other, but let the edge of your top card project a little over the rest; hold them between your finger and thumb, about two feet from the table, let them drop, and the top card (which must be, as we have said, the one drawn,) will fall with its face uppermost, and all the rest with their faces toward the table.

THE REGAL ALLIANCE.

Take four kings, and place between the third and fourth any two common cards whatever, which must be neatly concealed; then show the four kings, and place the six cards at the bottom of the pack; take one of the kings, and lay it on the top, and put one of the common cards into the pack nearly about the middle; do the same with the other, then show that there is one king at the bottom; desire any one to cut the pack, and as three of the kings were left at the bottom, the four will, therefore, be found together in the middle of the pack.

THE ODD SCORE.

Take a pack of cards, and let any gentleman draw one; then let him put it in the pack again, but contrive so as you may be sure to find it at pleasure, which you will be enabled with ease to do, by some of the preceding tricks; then shuffle the cards, and let another gentleman draw a card, but be sure you let him draw no other than the one before drawn, which you must force upon him; go on in this way until twenty persons have each drawn the same card; shuffle the cards together, and show your forced card, which will, of course, be every man's card who has drawn.

THE CARD IN THE EGG.

To do this wonderful feat you must have two sticks exactly resembling



TRICKS WITH CARDS.

203

magic. The person who has chosen it will put it into the pack again, and while you are shuffling, let it fall into your lap. Then, calling for some eggs, desire the person who drew the card, or any other person in the company, to choose any one of the eggs. When they have done so, ask the person if there be anything in it? He will answer there is not. Take the egg in your left hand, and the hollow stick in your right;—break the egg with the stick, let the spring go, and the card will be driven into the egg. You may then show it the spectators, but be sure to conceal the hollow stick, and produce the solid one, which place upon the table for examination.

THE PAINTED PACK.

Take a pack of cards, and paint the backs of one half of the pack with



what figures you think fit, as men, women, birds, flowers, &c. Also paint the faces of the other half of the cards in the same manner; thus you will have a complete pack of odd pictures, and may, by showing the faces, of that part of the pack whose backs only have been painted, and then, by a momentary shuffle, apparently transforming them into a set of grotesque figures, produce much amusement. There is another manner of making the pack; it is as follows:—Take a dozen cards, or more, and draw a line from the right-hand upper corner to the left-hand lower corner of the face of each of them; they will thus be all equally divided. Then paint part of some odd figure on the right division of each card, leaving the left untouched.

By a little dexterity, you may now seem to transform a set of common cards into a painted pack.



hard, put it into the nut or cherry-stone, stop the hole up with some bees wax, and rub it over with a little dust, and it will not be perceived; then while some by-stander draws a card, observe, "It is no matter what card you draw;" and, if you use the cards well, you will offer him, and he will receive, a similar card to that you have rolled up in the nut. Give h'm the nut and a pair of crackers, and he will find the name of the card he drew rolled up in its kernel.

THE CARD IN THE MIRROR.

Provide a circular mirror, the frame of which must be, at least, as wide as a card. The glass in the centre must be made to move in two grooves, and so much of the silvering must be scraped off as is equal to the size of a common card. Observe that the glass be likewise wider than the card. Then paste over the part where the quicksilver is rubbed off, a card that exactly fits the space. The mirror must be placed against a partition, through which two strings pass to an assistant in the adjoining room, who can easily move the glass in the grooves, and consequently, make the card appear or disappear at pleasure. Matters being thus prepared, contrive to make a person draw the same sort of card with that fixed to the mirror, and place it in the middle of the pack; then make the pass, and bring it to the bottom; direct the person to look for his card in the mirror, when the confederate, behind the partition, is to draw it slowly forward, and it will appear as if placed between the glass and quicksilver. While the glass is being drawn forward, you slide off the card from the bottom of the pack, and convey it away. The card fixed to the mirror may easily be changed each time the experiment is performed. This recreation may also be made with a print that has a glass before it, and a frame of sufficient width, by making a slit in the frame, through which the card is to pass; but the effect will not be so striking as in the mirror.

THE MOUSE IN THE PACK.



TRICKS WITH CARDS.

205

then in his hands, and while you engage his attention in conversation, take the box in the middle, throw the pack aside, and the mouse will remain in the hands of the person who held the cards.

THE MARCHING CARD.

One of the company is desired to draw a card, which is afterward fixed with the pack, and commanded to appear on the wall: it accordingly obeys, advancing as it is ordered, and describes an inclined line from the right to the left: it disappears at the top of the room, and appears an instant afterward, moving in a horizontal direction:—to do this, first force a card; after having shuffled the pack, withdraw the forced card, privately, and show the company the pack again, that they may see it is no longer there: when you order it to appear on the wall, a confederate adroitly draws a thread, at the end of which is previously fastened a similar card, which comes from behind a glass; it is fastened by very minute loops of silk to another thread fully stretched, along which it runs, and performs its route as directed.

THE BURIED HEART

A curious deception may be practised, by cutting out neatly, and thinly shuffling, the back of a club, which is then to be pasted slightly over an ace of hearts. After showing a person the card, let him hold one end of it, and you hold the other, and, while you amuse him with discourse, slide off the club; then, laying the card on the table, bid him cover it with his hands, knock under the table, and command the club to turn into the ace of hearts.

CONFEDERATE SIGNALS.

This amusement is to be performed by confederacy; you previously agree with your confederate on certain signs, by which he is to denote the



THE CARD IN THE POCKET-BOOK.

A confederate is previously to know the card you have taken from the pack, and put into your pocket-book; you then present the pack to him, and desire him to fix on a card, (which we will suppose to be the queen of diamonds) and place the pack on the table; you then ask him the name of the card, and when he says the queen of diamonds, you ask him if he is not mistaken, and if he be sure that the card is in the pack? When he replies in the affirmative, you say, "It might be there when you looked over the cards, but I believe it is now in my pocket; then desire a third person to put his hand in your pocket, and take out your book, and when it is opened the card will appear.

The assistant in this, and, in fact, in all similar tricks, must be dexterous he ought to understand what you wish him to do by the slightest hint,—a cough, a motion of the finger, or conjuring stick—or he will never answer for the confederate of a Conjuror



The King of Conjurors at Cards
His glib discourse oft interlards
With crabbed Greek, and Latin lame :—
By a eight o' hand, performing feats,
Which even magic put to shame.
But when he works his master-cheats,
This mighty King is forced to crave
The aid of some confederate Knave



PARADOXES AND PUZZLES.

Come hither all ye youthful Sages,
Come and peruse our sequent pages ;
We care not whence the good wind blows you.
For sure we are that we shall poze you.

PARADOXES and Puzzles, although by many persons looked upon as mere trifles, have, in numerous instances, cost their inventors considerable time, and exhibit a great degree of ingenuity. We can readily imagine that some of the complicated puzzles in the ensuing pages may have been originally constructed by captives, to pass away the hours of a long and dreary imprisonment ; thus does the misery of a few, frequently conduce to the amusement of many. We look upon a Paradox as a sort of superior riddle, and a tolerable Puzzle, in our opinion, takes precedence of a first-rate rebus. There is often considerable thought, calculation, patience, and management, required to solve some of these strange enigmas ; and we have, ere now, followed the traces of a Puzzle, and found it to be intricately headed in de-



well aware that he is within a single turn of a happy termination of his toils ; but what a mirthful moment is that, when, there being only two ways to turn, the one right and the other wrong, as is usually the case, he takes the latter, and becomes more than ever

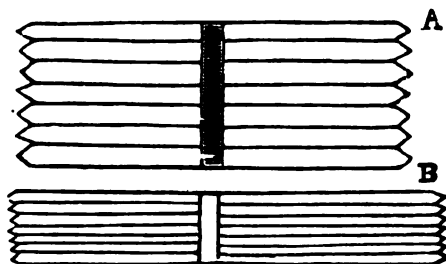
“ Pozed, puzzled, and perplexed ”

A Paradox or a Puzzle ought, perhaps, never to be explained ; the party to whom it is proposed should rather be left in ignorance of its solution, unless he succeed in discovering it himself ; if he fail after two or three efforts, and you disclose it, his vanity will be hurt, on account of his having been foiled by a question that, after its solution, appears so simple, or in some instances, he will call it silly and ridiculous ; whereas, if he discover it without assistance, he will praise it for its excellence, and be pleased at his own cleverness.

We now proceed to open our budget :—Our first article is—

TROUBLE-WIT.

Take a sheet of stiff paper, fold it down the middle of the sheet, long ways ; then turn down the edge of each fold outward, the breadth a penny ; measure it as it is folded, into three equal parts, with compasses, which make six divisions in the sheet ; let each third part be turned outward, and the other, of course, will fall right ; then pinch it a quarter of an inch deep, in plaits, like a ruff ; so that, when the paper lies pinched in its form, it is in the fashion represented by A ; when closed together, it will be like B ; uncloase it again, shuffle it with each hand, and it will resemble the shuffling of a pack of cards ; close it, and turn each corner inward with your fore-finger and

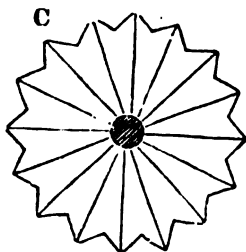




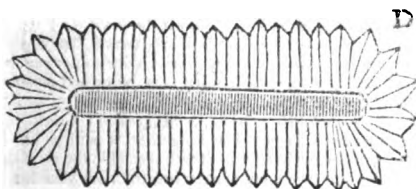
PARADOXES AND PUZZLES

209

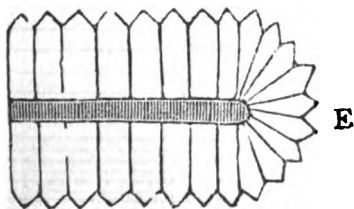
thumb, it will appear as a rosette for a lady's shoe, as C ; stretch it forth,



and it will resemble a cover for an Italian couch, as D ; let go your fore-



finger at the lower end, and it will resemble a wicket, E ; close it again

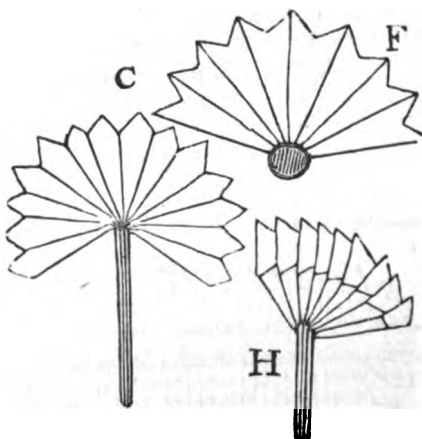




210

PARADOXES AND PUZZLES

and pinch it at the bottom, spreading the top, and it will represent a fan, as F; pinch it half-way, and open the top, and it will appear in the form shown by G; hold it in that form, and with the thumb of your left hand, turn out the next fold, and it will be



In fact, by a little ingenuity and practice, Trouble-wit may be made to assume an infinite variety of forms, and be productive of very considerable amusement.

THE SLIGHTED LADY

We shall suppose there are 13 ladies in company, one of whom was with



PARADOXES AND PUZZLES.

211

found, that the eleventh, reckoning from the one by whom you began, will remain the last ; and, consequently, will have no share in the distribution ; you of course, will begin counting with the one who stands second in the ring from the party to be excluded.

The following table will show the person, before her whom you wish to exclude, with whom you must begin to count 9 ; supposing, always, that the number of the nosegays is less by one than that of the persons.

For 13 persons, the 11th before.

12	.....	2d.
11	.....	5th.
10	.....	7th.
9	.....	8th.
8	.....	8th.
7	.....	7th.
6	.....	5th.
5	.....	3d.
4	.....	3d.
3	.....	2d.
2	.....	1st

THE WINE MERCHANT AND HIS CLERK.

A wine-merchant caused 32 casks of choice wine to be deposited in his cellar, giving orders to his clerk to arrange them, as in the annexed figure, so that each external row should contain nine. The clerk, however, took away 12 of them, at three different times ; that is, four each time ; yet, when the merchant went into the cellar, after each theft had been committed, the clerk always made him count nine in each row. How was this possible ?

1	7	1
7		7
1	7	1

This problem may be easily solved by inspecting the following figures :—



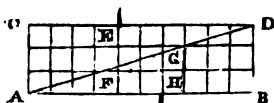
PROFIT AND LOSS

A man bought ninety-six apples at three a penny, and the same number at two a penny; he sold them again at the rate of five for two-pence. Query. Did he gain or lose?

Answer. He lost. The ninety-six apples, at three a penny, cost him 2s. 8d., and the ninety-six, at two a penny, 4s., making together, 6s. 8d. He had one hundred and ninety-two apples, and sold thirty-eight two-penny-worths; for which he received, of course, 6s. 4d. When he had done this, he had only two apples left: he, consequently, lost a fraction above $3\frac{1}{2}$ d.

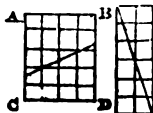
THE GEOMETRICAL MONEY.

Draw on pasteboard the following rectangle, whose side, A C, is three inches, and A B, ten inches. Divide the longest side into ten equal parts,



and the shortest into three equal parts, and draw the perpendicular lines, as in the figure, which will divide it into thirty equal squares. From A to D draw the diagonal line, and cut the figure, by that line, into two equal triangles, and

cut those triangles into two equal parts, in the direction of the lines, E F and G H. You will then have two triangles, and two four-sided irregular figures, which you are to place together, in the manner they stood at first, and in each square you are to draw the figure of a piece of money; observing to make those in the squares through which the line, A D, passes, somewhat imperfect.



As the pieces stand together in the foregoing figure, you will count thirty pieces of money only: but if the two triangles and the two irreg-



PARADOXES AND PUZZLES.

213

only: supposing he wanted to make it sufficiently large to hold double that number,—how many additional hurdles would he have occasion for?

Answer. Two. There were 48 hurdles on each side of the pen; a hurdle at the top, and another at the bottom; so that, by moving one of the sides a little back, and placing an additional hurdle at the top and bottom the size of the pen would be exactly doubled.

THE IMPOSSIBILITY MADE POSSIBLE.

Place three pieces of money on the table, and desire some person to take away the pieces from the centre without touching it.

If the manner of executing it be not discovered, remove one of the end pieces to the other side, and thus you take away the piece from the centre without touching it.

THE CURIOUS CROSS.

Compose a cross, with thirteen sixpences, shillings, or any other coins, as No. 1, in which it will be perceived you may reckon nine in three different ways; that is to say, in the entire perpendicular line, up the perpendicular line to the cross line, and including the cross line, first on the right, then on the left. These are the qualities of the cross. The puzzle is to take two of the pieces away, and still to leave the same qualities in the cross. This is done by taking away the two outside pieces of the cross line, and lifting the two which remain one piece higher. The figure will then be as No. 2

No. 1.	No. 2.
c	o
c	ooo
ooooo	o
o	o
o	o
o	o
o	o
o	o
o	o

SEVEN IN TWO.

Cut a piece of bread, or paper, in the form of a house-shoe, (*vide* Fig. 1,) and desire some person, by two cuts, to divide it into seven pieces.



The manner of doing this is as follows:—Cut across from *a* to *b*; this will divide the shoe into three pieces: then place the two ends by the side of the upper part, as Fig. 2, and cut across from *c* to *d*. The shoe will then be cut into seven pieces.



THE PARTIAL REPRIEVE.

To arrange 80 criminals in such a manner that, by counting them in one cession, always beginning again at the first, and rejecting every ninth person, 15 of them may be saved :—Arrange the criminals according to the order of the vowels in the following Latin verse :

4 5 2 1 3 1 1 2 2 3 1 2 2 1
Populeam virgam mater regina ferebat.

Because *o* is the fourth in the order of the vowels, you must begin by four of those whom you wish to save ; next to these place five of those whom you wish to punish ; and so on alternately, according to the figures which stand over the vowels of the above verse.

FAMOUS FORTY-FIVE.

How can number 45 be divided into four such parts that, if to the first part you add two, from the second part you subtract two, to the third part you multiply by two, and the fourth part you divide by two, the sum of the addition, the remainder of the subtraction, the product of the multiplication and the quotient of the division, be all equal ?

Answer.

The 1st is 8, to which add 2, the sum is 10
 The 2d is 12, subtract . . . 2, the remainder is 10
 The 3d is 5, multiplied by 2, the product is 10
 The 4th is 20, divided by 2, the quotient is 10

—
 45

THE WOLF, THE GOAT, AND THE CABBAGES.

Suppose a man have a wolf, a goat, and a basket of cabbages, on the bank of a river, that he wishes to cross with them ; and that his boat is only big enough to carry one of the three besides himself. He must, therefore, take them over one by one, in such a manner, that the wolf shall have no opportunity of devouring the goat, or the goat of devouring the cabbages. How is he to do this ?

Answer. First, he takes over the goat ; he then returns, and takes the wolf ; he leaves the wolf on the other side, and brings back the goat ; he now takes over the cabbages, and comes back once more, to fetch the goat. Thus, the wolf will never be left with the goat, nor the goat with the cabbages.

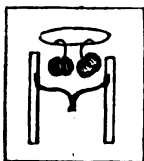
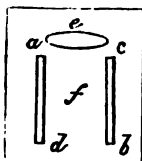


PARADOXES AND PUZZLES.

215

THE CHERRY CHEAT.

Cut two longitudinal slips out of a card, as *a b c d* (Fig. 1); also, cut out an oval above these slips, as *e*. Take the part (*f*) between the two longitudinal apertures, with your finger and thumb,



and draw it toward you, until the card be bent into a half-circle; pass part of *f* through the oval, *e*, and then, through the part of *f* so passed through *e*, introduce one of two cherries, whose stems grow together. Let the stems, and also *f*, pass back through the oval;

put your card as much in the original position as possible again, and it will appear as Fig. 2. The puzzle is to get the cherries off without breaking their stems, or damaging the card. It is only to be done in the manner described for putting them on.

THE TRIPLE ACCOMMODATION

To form a regular geometrical solid, which shall fill up a circle, a square, and a triangle. Take a round piece of wood; let its height be the same as its diameter; mark a line diametrically through its centre, at one end (Fig. 1); then cut away the wood, right and left, from the line at the top, regularly, toward each edge, at the bottom. You will then have Fig. 2



Then, in a piece of card, or thin board, cut a circle of the same diameter, as the base of the figure you have formed, and a square, each side of which is the same as the

diameter of the circle: also, a triangle, whose base and height are the same as the square; and the figure you have cut out will exactly fit all three. This may be performed for the sake of amusement with a card of any size.



to have a house situated in his own ground, with the governor's in the centre. How many people's land must the governor pass through before he gets to the outside of the whole ?

Answer. Two ; for the ground being a square, it will consist of five towns, each five acres.

EIGHTEEN WORDS IN TWENTY-THREE LETTERS.

What do the following letters signify in the French language, pronounced in the order in which they stand ?

l a n e o p y l i a v q l i a t t l i e d e d

Answer. Hélène est née au pays grec, elle y a vécu, elle y a tété, elle y est décédée.

THE PUZZLING RINGS.

This perplexing invention is of great antiquity, and was treated on by Cardan, the mathematician, at the beginning of the sixteenth century. It consists of a flat piece of thin metal or bone, with ten holes in it ; in each hole a wire is loosely fixed, beaten out into a head at one end, to prevent its slipping through, and the other fastened to a ring, also loose. Each wire has been passed through the ring of the next wire, previously to its own ring being fastened on ; and through the whole of the rings, runs a wire loop or bow, which also contains, within its oblong space, all the wires to which the rings are fastened ; the whole presenting so complicated an appearance, as to make the releasing the rings from the bow appear an impossibility. The construction of it would be found rather troublesome to the amateur, but it may be purchased at most of the toy-shops, very lightly and elegantly made. It also exists in various parts of the country, forged in iron, perhaps, by some ingenious village mechanic, and aptly named "The Tiring Irons." The following instructions will show the principle on which the puzzle is constructed, and will prove a key to its solution.

Take the loop in your left hand, holding it at the end B, and consider the rings as being numbered 1st to 10th. The 1st will be the extreme ring to the right, and the 10th the nearest to your left hand.

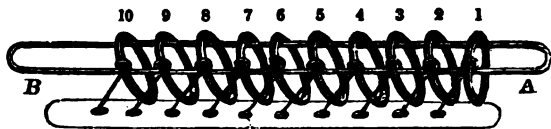
It will be seen that the difficulty arises from each ring passing round the wire of its right-hand neighbour. The extreme ring at the right hand, of course, being unconnected with any other wire than its own, may, at any time, be drawn off the end of the bow at A, raised up, dropped through the bow, and finally released. After you have done this, try to pass the 2d ring in the same way, and you will not succeed, as it is obstructed by the wire of the 1st ring ; but if you bring the 1st ring on



PARADOXES AND PUZZLES.

217

again, by reversing the process by which you took it off, *viz.* by putting it up through the bow, and on to the end of it, you will then find, that by taking the 1st and 2d rings together, they will both draw off, lift up, and drop through the bow. Having done this, try to pass the 3d ring off, and



you will not be able; because it is fastened on one side to its own wire, which is within the bow, and on the other side, to the 2d ring, which is without the bow. Therefore, leaving the 3d ring for the present, try the 4th ring, which is now at the end all but one, and both of the wires which affect it being within the bow, you will draw it off without obstruction; and, in doing this, you will have to slip the 3d ring off, which will not drop through, for the reasons before given; so, having dropped the 4th ring through, you can only slip the 3d ring on again. You will now comprehend, that (with the exception of the 1st ring) the only ring, which can at any time be released, is that which happens to be 2d on the bow, at the right-hand end; because both the wires which affect it, being within the bow, there will be no impediment to its dropping through. You have now the 1st and 2d rings released, and the 4th also,—the 3d still fixed; to release which, we must make it last but one on the bow, and to effect which, pass the 1st and 2d rings together through the bow, and on to it; then release the 1st ring again by slipping it off, and dropping it through, and the 3d ring will stand as 2d on the bow, in its proper position for releasing, by drawing the 2d and 3d off together, dropping the 3d through, and slipping the 2d on again. Now



slip the first off, and down through the bow; then bring the 3d up, through and on to the bow; then bring the 1st ring up and on again, and, releasing the 1st and 2d together, bring the 4th through, and on to the bow, replacing the 3d: then bring the 1st and 2d together on, drop the 1st off and through, then the 3d the same, replace the 1st on the bow, take off the 1st and 2d together, and the 5th will then stand 2d, as you desired; draw it toward the end, slip it off and through, replace the 4th, bring the 1st and 2d together up and on again, release the 1st, bring on the 3d, passing the 2d ring on to the bow again, replace the 1st in order to release the 1st and 2d together; then bring the 4th toward the end, slipping it off and through, replace the 3d, bring the 1st and 2d together up and on again, release the 1st, then the 3d, replacing the 2d, bring the 1st up and on, in order to release the 1st and 2d together, which having done, your 8th ring will then stand 2d, consequently you can release it, slipping the 7th on again. Then to release the 7th, you must begin by putting the 1st and 2d up and on together, and, going through the movements in the same succession as before, until you find you have only the 10th and 9th on the bow; then slip the 10th off and through the bow, and replace the 9th. This dropping of the 10th ring is the first effectual movement toward getting the rings off, as all the changes you have gone through, were only to enable you to get at the 10th ring. You will then find that you have only the 9th left on the bow, and you must not be discouraged on learning, that in order to get that ring off, all the others to the right hand must be put on again, beginning by putting the 1st and 2d together, and working as before, until you find that the 9th stands as 2d on the bow, at which time you can release it. You will then have only the 8th left on the bow; you must again put on all the rings to the right hand, beginning by putting up the 1st and 2d together, till you find the 8th standing as 2d on the bow, or in its proper position for releasing; and so you proceed, until you find all the rings finally released.

As you commence your operations with all the rings ready fixed on the bow, you will release the 10th ring in 170 moves; but as you then have only the 9th on, and as it is necessary to bring on again all the rings up to the 9th, in order to release the 9th, and which requires 15 moves more, you will consequently, release the 9th ring in 256 moves; and, for your encouragement, your labor will diminish, by one half, with each following ring which is finally released. The 8th comes off in 128 moves, the 7th in 64 moves, and so on, until you arrive at the 2d and 1st rings, which come off together, making 681 moves, which are necessary to take off all the rings. With the experience you will, by this time, have acquired, it is only necessary to say, that to replace the rings, you begin by putting up the 1st and 2d together, and follow precisely the same system as before.

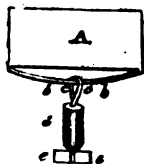


PARADOXES AND PUZZLES.

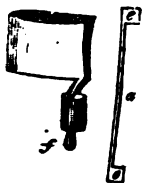
219

THE CARD PUZZLE.

One of the best puzzles hitherto made, is represented in the annexed cut. *A*, is a piece of card; *b b*, a narrow slip divided from its bottom edge, the whole breadth of the card, except just sufficient to hold it on at each side; *c c*, is another small slip of card, with two large square ends, *e e*; *d*, is a bit of a tobacco-pipe, through which *c c* is passed, and which is kept on by the two ends, *e e*. The puzzle consists in getting the pipe off without breaking it, or injuring any other part of the puzzle. This, which appears to be impossible, is done in the most simple manner. On a moment's consideration, it will appear plainly, that there must be as much difficulty in getting



the pipe in its present situation, as there can be in taking it away. The way to put the puzzle together, is as follows:—The slip, *c c*, *e e*, is cut out of a piece of card, in the shape delineated in Fig. 3. The card in the first figure, must then be gently bent at *A*, so as to allow of the slip at the bot-



tom of it being also bent sufficiently to pass double through the pipe, as in Fig. 2. The detached slip with the square ends, (Fig. 3,) is then to be passed half way through the loop, *f*, at the bottom of the pipe; it is next to be doubled in the centre, at *a*, and pulled through the pipe, double, by means of the loop of the slip to the card. Upon unbending the card, the puzzle will be complete, and appear as represented in Fig. 1. In order to take the pipe off, the card must be doubled, as (Fig. 2,) the slip passed through it, until there is sufficient of the loop below the pipe to allow of one

of the square ends of the slip (Fig. 3) being passed through it. Fig. 3 is



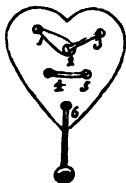
THE SQUARE HOLE AND ROUND STOPPER

How can a mechanic file a square hole with a round file, and fill up an oval hole with a round stopper?

Answer. A piece of pliable metal being doubled, by applying a round file to the double edge, and filing a half square gap, on opening the metal, a square will appear. Again, if two corners and an edge, at the end of a miser's iron chest, be filed away with a round, or any other file, there will be an exact square hole left. And further, if a cylindrical body be cut obliquely, the plane of the section will be an oval; and, consequently, a round body, situated obliquely in an oval hole, will completely fill it.

THE HEART AND BALL PUZZLE.

To make this puzzle, it is only necessary to cut a thin piece of wood into the shape of a heart, to make six holes in it, as represented in the annexed cut, and provide a thin silken cord, which is to be doubled, and the two ends fastened into a small wooden ball. To play the ball on, pass the loop through the hole 6, from face to back, up to 2, through which bring it, and then through 3, 5, 4, and 1, in succession: then through 2 again, and down the back to 6; bring it through 6 to the face, and pass it over the ball; then draw the loop back again through 6 and 2, and the puzzle (which is to take the ball and string off after being thus fixed) is set. To play the ball off, place the heart before you in the position described by the cut: slacken the string by drawing, at the back, the ball toward the hole 6; then loosen the rest of the string by pulling it toward you, and draw up the loop as far as you can: then pass the loop through hole 2, down the other side of the heart, to 6: through which bring it to the face, and pass it over the ball; then draw the loop back again

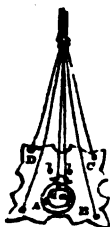




PARADOXES AND PUZZLES.

221

times the thickness of the cord you will afterward use, and, in the middle of the board, make four smaller round holes, in the form of a square, and about half an inch between each. Then take four pieces of thin silken cord, each about six inches long, pass one through each of the four corner holes, tying a



knot underneath at the end, or affixing a little ball or bead to prevent its drawing through; take another cord, which, when doubled, will be about seven inches long, and pass the two ends through the middle holes, *a a*, from the front to the back of the board, (one cord through each hole,) and again from back to front through the other holes, *b b*: tie the six ends together in a knot, so as to form a small scale, and proportioning the length of the cords, so that when you hold the scale suspended, the middle cord, besides passing through the four centre holes, will admit of being drawn up into a loop of about half an inch from the surface of the scale: provide a ring of metal, or bone, of about three quarters of an inch in diameter, and place it on the scale, bringing the loop through its middle: then draw-

ing the loop a little through the scale toward you, pass it, double as it is, through the hole at the corner, *A*, over the knot underneath, and draw it back: then pass it in the same way through the hole at corner *B*, over the knot, and draw it back: then drawing up the loop a little more, pass it over the knot at top, and, afterward, through the holes *C* and *D*, in succession, like the others, and the ring will be fixed. The puzzle consists in releasing the ring; to effect which, you have only to reverse the former process, by passing the loop through the holes, *D*, *C*, *B*, and *A*, in the manner before described.

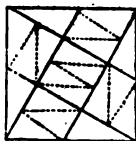
THE OYSTER WAGER.

Two men eat oysters together for a wager, who should eat most. One eat ninety-nine only, the other eat a hundred and won. How many did the winner eat? *Answer.* One hundred.



THE SQUARES OF TRIANGLES.

Cut twenty triangles out of a square bit of wood, as marked in the engraving, mix them up together, and bid any person make an exact square of them. The key to this puzzle may be acquired



by remembering the black lines in the cut; by which it will be seen, that four triangles are to be placed at the corners, and a small square made in the centre; when this is done, the remainder is easy of execution. A piece of card will do instead of wood; it is much easier to cut out; but, on account of its warping, wood is to be preferred to it. Great care must be taken that all the edges

are smooth and regular; for if any of them are notched, or wavy, so as to tally with each other, they may, of course, with little difficulty, be put together.

Many other Puzzles, similar to the Square of Triangles, may, with a little ingenuity, be constructed, in such a manner as to afford their young inventor the means of much amusement.



VARIETIES



Bluff Echoes, who roars across the deep
And howls among the mountain pines to-day,—
To-morrow, on the harp or lyre, will breathe
Such melting music, as from Memnon's head,
When first Apollo's gleam fell on his brow,
Was heard to issue in the days of yore

THE ÆOLIAN HARP

THE instrument consists of a long narrow box of very thin deal, about
five or six inches deep, with a circle in the middle of the upper side, of an
inch and a half in diameter, in which are to be drilled small holes. On this
side, seven, ten, or more strings, of very fine gut, are stretched over bridges
at each end, like the bridge of a fiddle, and screwed up, or relaxed with

**TO MAKE FRUIT AND FLOWERS GROW IN WINTER.**

Take up the trees, on which the fruit grows, by the roots, in the spring just as they put forth their buds, taking care to preserve some of their own earth about the roots. Set them, standing upright, in a cellar, till the middle of September, and put them into vessels with an addition of earth; then bring them into a stove, taking care to moisten the earth around them every morning with rain water, in a quart of which, dissolve the size of a walnut of sal-ammoniac, and about the middle of March the fruit will appear.

TO CONVERT PAPER INTO FRAMES FOR PICTURES.

For this purpose, a convenient quantity of the best sort of white paper must be steeped for two or three days in water, till it becomes very soft; then, being reduced by the mortar and hot water into a thin pulp, it is to be laid upon a sieve to draw off its superfluous moisture; after which, it is to be put into warm water, wherein a considerable quantity of fresh glue, or common size, has been dissolved; it may then be placed in moulds, to acquire the desired figure, and when taken out, may be strengthened as occasion requires, with plaster or moistened chalk, and when dry, painted or overlaid.

TO TAKE THE IMPRESSION OF BUTTERFLIES ON PAPER.

Clip the wings of the butterflies; lay them upon clean paper in the form of the insect when flying. Spread some pure thick gum-water on another piece of paper, press it on the wings, and it will take them up; lay a piece of white paper over it, and rub it gently with your finger, or the smooth handle of a knife. The bodies are to be drawn in the space which you leave between the wings.

THE DEAF MADE TO HEAR.

Procure a stringed instrument, with a neck of some length, as a lute, a guitar, or the like; and, before you begin to play, you must, by signs, direct the deaf man to take hold, with his teeth, of the end of the neck of the instrument; then, if you strike the strings with the bow one after another, the sound will enter the deaf man's mouth, and be conveyed to the organ of hearing through the hole in the palate; and thus the deaf man will hear, with a great deal of pleasure, the sound of the instrument, as has been several times experienced; nay, those who are not deaf may make the experiment upon themselves, by stopping their ears, so as not to hear the instrument in the usual way, and then holding the end of the instrument in their teeth while another touches the strings.

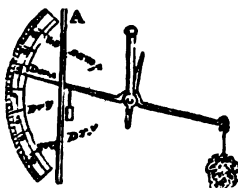


VARIETIES.

425

THE HYDROMETER.

The hydrometer is an instrument to measure the degrees of dryness or moisture of the atmosphere. There are various kinds of hydrometers;



for whatever body either swells or shrinks by dryness or moisture, is capable of being formed into an hydrometer; such are woods of moist kinds, particularly ash, deal, poplar, &c. The following is the most lasting and convenient mode of constructing an instrument of this description:—Take a very nice balance, and place in it a sponge, or other body which easily imbibes moisture, and let it be in equilibrio with a weight hung at the other end of the beam. If the air become

moist, the sponge, becoming heavier, will preponderate; if dry, the sponge will be raised up. This balance may be contrived two ways, by either having the pin in the middle of the beam, with a slender tongue, a foot and a half long, pointing to the divisions of an arched plate, fitted to it; or the other extremity of the beam may be so long, as to describe a large arch on a board placed for the purpose.

To prepare the sponge, it may be necessary to wash it in water, and, when dry, in water or vinegar, in which sal-ammoniac, or salt of tartar, has been dissolved, and let it dry again; then it is fit to be used. The instrument can be hung against a wall; and, in that case, a bit of steel, as at A, should be placed before the needle, to keep it straight.

THE AWN OF BARLEY HYDROMETER.

The awn of barley is furnished with stiff points, which, like the teeth of a saw, are all turned toward the lesser end of it; as it lies upon the ground, it extends itself in the moist night air, and pushes forward the barley-corn, which it adheres to in the day; it shortens as it dries; and as these points prevent it from receding, it draws up its pointed end; and thus, creeping

pushed forward; in dry weather, the hinder feet were drawn after, as the obliquity of the points of the feet prevented it from receding.

SUBSTITUTE FOR A COPYING MACHINE.

Write with common ink, in which lump sugar has been dissolved—four scruples, or one and a half drachm of sugar to one ounce of ink. Moisten copying paper, by passing a soft wet brush over it; then press it gently between soft cap paper, so as to absorb the superabundant moisture. Put this moistened paper upon the writing, and both between some smooth soft paper, placing the whole within the folds of a carpet, when by pressure, a correct copy will be obtained.

TO PRESERVE ROSES TILL CHRISTMAS.

When roses are budding and blooming is the time to lay by a treat for Christmas. Select from your rose-trees such buds as are just ready to blow; tie a piece of thin thread round the stalk of each; do not handle the bud or the stalk; cut it from the tree with the stalk two or three inches in length; melt sealing-wax, and quickly apply it to the end of the stalk; the wax should be only so warm as to be ductile; form a piece of paper into a cone-like shape, wherein place the rose; screw it up so as to exclude the air; do so by each; put them into a box, and the box into a drawer; all which is intended to keep them free from air. On Christmas-day, or on any other day in winter, take them out, cut off the ends of the stalks, place them in a flower-pot or bottle, with lukewarm water, or, if in a heated room, the water may be cold; in two or three hours, they will blow, retaining all their fragrance as in the meridian of summer.

MAGNIFICENT CRYSTALS.

A solution of the salt to be crystallized is to be slowly evaporated to such a consistency that it shall crystallize upon cooling, which may be known by letting a drop of it fall on a plate of glass. When it is in this state, set it



VARIETIES

227

add a fresh solution of the salt, as before directed, and turn every crystal several times a-day. By this treatment, you may obtain them almost of any size desired. It is necessary to pour off the liquid from the crystals, and add fresh liquid in its place, very frequently; as the solution, after depositing a certain portion of its salts, becomes weakened, and then attacks the crystals, rounding off their angles, in the first place, as an attentive observer may perceive, and infallibly destroying them, unless renewed. By a little dexterity, a regular crystal of alum may be thus obtained.

CRYSTALLIZATION UPON CINDERS.

Saturate water, kept boiling with alum; then set the solution in a cool place, suspending in it by a hair or fine silk thread, a cinder; as the solution cools, a beautiful crystallization will take place upon the cinder, which will resemble a specimen of mineralogical spar.

TO PRODUCE VARIOUS FLOWERS FROM ONE STEM.

Scoop the pith from a small twig of elder; split it lengthways, and fill each of the parts with seeds that produce flowers of different colors. Surround them with earth, and then tying the two bits of wood, plant the whole in a pot filled with earth. The stems of the different flowers will thus be so incorporated, as to exhibit to the eye only one stem, throwing out branches covered with flowers analogous to the seed which produced them. By selecting the seeds of plants which germinate at the same period, and which are nearly similar in regard to the texture of their stems, an intelligent person may obtain artificial plants exceedingly curious.

HARLEQUIN INKS.

Inks, of various colors, may be made in the modes following: they are very beautiful, and frequently of considerable utility. For red ink, boil an ounce of fine chips of Brazil-wood, in half a pint of water, for a quarter of an hour; add to the decoction, three drachms of gum-arabic, and as much alum as it will dissolve. For blue, diffuse Prussian blue or indigo through strong gum-water. For scarlet, dissolve vermilion in gum-water. Inks of other colors may be made from a decoction of the materials used in dying, mixed with a little alum and gum-arabic.

TO BRONZE PLASTER BUSTS, &c.

Apply isinglass size, until no part of the surface become dry or spotted, then, with a brush, go over the whole, observing carefully to remove any of the size, while it is yet soft, that may lodge on the delicate or sharp places and set the bust aside to dry. Then take a little very thin oil gold-size, and with as much of it as will just damp the brush, go over the figure, allowing

u



no more of this size to remain, than what causes it to shine. Set it in a dry place, free from smoke; and after it has remained there forty-eight hours the figure is prepared for brouzing. The bronze powder may be had at the color shops, of all metallic colors; it should be dabbed on with a little cotton wool. After having touched the extremities of the whole figure, let it stand another day; then, with a soft dry brush, rub off all the loose powder and the figure will resemble the metal which it is intended to represent, and possess the quality of resisting the weather.

TO CUT GLASS

Make a small notch, by means of a file, on the edge of a piece of glass; then, make the end of a tobacco-pipe, or of a rod of iron of the same size, red-hot in the fire; apply the hot iron, or pipe, to the notch, and draw it slowly along the surface of the glass in any direction you please; a crack will be made in the glass, and will follow the direction of the iron. Cylindrical glass vessels, such as flasks, may be cut in the middle, by wrapping round them a worsted thread dipped in spirit of turpentine, and setting it on fire when fastened on the glass.

THE ECLIPSE GLASS

Take a burning glass, or a spectacle-glass that magnifies very much; hold it before a book or pasteboard, twice the distance of its focus, and you will see the round body of the sun, and the manner in which the moon passes between the glass and the sun, during the whole eclipse.

TO CALM AGITATED WATER.

Drop a small quantity of oil into water agitated by the wind; it will immediately spread itself with surprising swiftness upon the surface, and the oil though scarcely more than a tea-spoonful, will produce an instant calm over a space several yards square. It should be done on the windward side of a pond or river, and you will observe it extend to the size of nearly half an acre, making it appear as smooth as a looking-glass. One remarkable circumstance in this experiment is, the sudden wide and forcible spreading of a drop of oil on the surface of the water; for, if a drop of oil be put upon a highly polished marble table, or a looking-glass, laid horizontally, the drop remains in its place, spreading very little; but when dropped on water, it spreads instantly many feet round, becoming so thin, as to produce the iris



VARIETIES.

323

ENGRAVING ON EGG-SHELLS.

Design on the shells any figure or ornament you please, with melted tallow, or any other fat oily substance; then immerse the eggs in very strong vinegar, and let them remain until the acid has corroded that part of the shell which is not covered with the greasy matter, those parts will then appear in relief, exactly as you have drawn them.

LAUGHING GAS.

A few lines on the mode of preparing and administering nitrous oxide gas, or, as it is termed, Laughing Gas, will, we doubt not, prove acceptable and interesting. Although not fitted to support life, yet it may be respired for a short time, and the effects, produced by it upon the animal frame, are its most extraordinary properties. The manner of breathing it is this: the nitrous oxide gas, having been previously purified by standing over water, is put into a large bladder, or varnished silk bag, having a wide glass tube, or a stop-cock with a large bore, affixed to its neck. The bladder is then held by the tube in the right hand, the mouth of it being closed by applying the thumb, and the nostrils are closed with the left hand; the air contained in the lungs is expelled by a long respiration; and the tube of the bladder being instantly applied to the mouth, the gas is breathed from and into the bladder as long as possible, which, perhaps, will be about two or three minutes. The effects differ greatly, according to the constitutions of the persons by whom it is respired. In general, however, they are highly agreeable. Exquisite sensations of pleasure,—an irresistible propensity to laughter,—a rapid flow of vivid ideas,—singular thrilling in the toes, fingers and ears,—a strong incitement to muscular motions,—are the ordinary feelings produced by it. We have read of one gentleman, who, after breathing the gas some time, threw the bag from him, and kept breathing on laboriously with an open mouth, holding his nose with his fingers, without the power to remove them, though perfectly aware of his ludicrous situation; he had a violent inclination to jump over the chairs and tables, and seemed



select from any of the prints or caricatures that fall in his way ; but the general compass of the face part should be within about the same space in all of them. Then divide each card into three pieces, cutting it across in a line just below the eye, and again, across the upper lip ; the middle piece will be narrower than the upper or lower piece. A box should be provided with partitions in it, so as to keep all the parts in their respective classes. The cards should be cut straight, so that the pieces of each will fit all the others, and all the tops should be of the same width ; all the middles of one width, but narrower than the tops, and all the bottoms about the same size as the tops.

An almost endless variety of changes may be obtained, by placing the forehead of one card in contact with the nose on a second, and the chin on a third. Thus, a laughable effect is produced by putting the red carbuncled nose of a City Alderman under the helmet of a Roman warrior, and finishing him below with the kerchiefed neck and shoulders of an old woman ; or the cap, eyes, and nose of Moll Flaggon over the flowing wig and robes of a Judge on a court day.



THE RIDDLER

A riddle is not solved, impatient strd,
By peeping at its answers in a trice ;—
When Gordius, the plough-boy King of Phrygia
Tied up his implements of husbandry
In the star-flam'd knot,—rash Alexander
Did not undo, by cutting it in twain

RIDDLES are by no means of modern origin ; the Sphinx puzzled the brains of some of the heroes of antiquity, and even Alexander the Great, as it is written, made several essays to untie the knot (a practical riddle) with which Gordius, the Phrygian king, who had been raised from the plough to the throne, tied up his implements of husbandry in the temple, in so intricate a manner, that universal monarchy was promised to the man who could undo it : after having been repeatedly baffled, he, at length, drew his sword, considering that he was entitled to the fulfilment of the promise, by cutting the Gordian knot.

Charades, Rebuses, Conundrums, &c. are, with many persons, favorite



verbal distortions ; but still, these distortions are often so droll as to excite mirth. Anagrams, or the letters of a name resolved into any apt phrase, were, at one time, considered of great importance ; many of them by no means lack humor. A work of thrice this bulk would scarcely contain all the Enigmas, Charades, &c. now current : we have, therefore, endeavored to make a judicious selection from the mass.

CHARADES.

1.

My first is a part of the day,
My second at feasts overflows ;
In the cottage my whole is oft seen,
To measure old Time as he goes.

2.

A cat does my first, and men drink at my second ;
My whole is the drift of an argument reckon'd

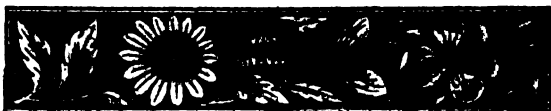
3.

My first gave us early support,
My next is a virtuous bias ;
To the fields if at eve you resort,
My whole you will probably pass.

4.

My first, a native of the ground,
In English countries much prevails ;
My next's in every county found,
My whole was never out of Wales

5.



CHARADES.

273

My whole—a creeping flower so fair,—
Regales the eye, and scents the air.

7.

My first is to ramble; my next to retreat.
My whole oft enrages in summer's fierce heat.

8.

My first do all nurses possess,
And dandle my second upon it;
My whole is a part of the dress
Attached to the cap or the bonnet.

9.

My first oft preys upon my second:
My whole a bitter shrub is reckon'd.

10.

My first in fruit is seldom rare;
My second all relations are:
My whole is only earthen-ware.

11.

My first dreads my second, for my second destroys my first, while many
delight in my whole.

12.

In every hedge my second is,
As well as every tree;
And when poor school-boys act unkind,
It often is their foe.
My first, likewise, is always wicked,
Yet ne'er committed sin:
My total for my first is fited,
Compos'd of brass or tin.

15.

My first's a prop, my second's a prop, and my whole's a prop.

16.

My first is in most shops ;
In every window my second :
My whole is used for the bed,
And, in winter, a comfort is reckon'd.

17.

My whole is under my second, and surrounds my first.

18.

My first assuages the appetite of a horse, and agonizes the foot of a man ;
my second, if made of brick, is good ; when of stone, better ; and, as the
seaman would say, when wooden, is best of all : my whole is famous for
its—(but hold ! we must make a charade upon a charade here)—take the
principal produce of China, a part of the body that is often black, and as
frequently gray or blue, and a useful domestic bird,—or, rather, the three
letters which, in pronunciation, resemble these things,—and they will
show for what my whole is famous.

19.

My first, if you do, you won't hit ;
My next, if you do, you won't leave it ;
My whole, if you do, you won't guess it.

20.

My first we oft lend to each other in turn,
To borrow it would be excessively droll ;
My next, near my first you may often discern ;
As my first, too, alas ! you'll perhaps find my whole

21.

My first is appropriate ; my second 'tis nine to one if you guess it ; my
whole elevates the sole above the earth.

22.

My first is always ;
My second durable ;
My whole without end.

23.

My first marks time ; my second spends it ; and my whole tells it



CHARADES.

235

24.

My first makes all nature appear with one face ;
At my second is music and beauty and grace ;
And if this charade is not easily said,
My whole you deserve to have thrown at your head.

25.

My first is a tree which with cedars will vie,
My second's the tenderest part of the eye.
My whole is a fruit which to none will give place,
For delicate flavour, and exquisite taste.

26

Of my first there is but one in the year :—of my second, but two in the world :—and my whole has every quality of a vegetable, except vegetation.

27.

Drink deep of my first : admit me to your second : and let me play upon my whole.

28.

My first troubles you in summer : my next is a most careful mother : my whole is no Christian.

29.

If you are able to do my first as well as my second can, you will soon be a good player at my whole.

30.

My first is an important part of the human frame ; a constituent of all bodies, regular or irregular ; it is sometimes *in* sometimes *out*, sometimes *this* and sometimes *that*, sometimes *one* and sometimes the *other*. My second is a common action,—sometimes induced by the hurry of business, sometimes by the mere love of pleasure ; it offers economy the cheapest medicine, and taste the most picturesque scenery ; it is what English ladies like best, and Turks like least ; and it may well be said to be fashionable, for it is *the go* throughout the world. My whole is indispensable in every city.—yet val-



32.

My first on foreign churches you may greet :
At home it's seldom found in church, or street ;
My second oft is used by household care,
To make old garments fit for folks to wear ;
My whole may well describe ill-humored folks,
Who knit their brows at puns, charades, and jokes.

CONUNDRUMS.

1. What does a seventy-four gun ship weigh, with all her crew on board, just before she sets sail ?
2. Why is a short negro like a white man ?
3. Why is the statute book like the Grecian army before Troy ?
4. Why is your nose like V in civility ?
5. Why is Virgil's greatest work like a baker ?
6. What is most like a horse's shoe ?
7. Who is that lady, whose visits nobody wishes, though her mother is welcomed by all parties ?
8. What is that which few like to give away, and yet nobody wishes to keep ?
9. What word is that in the English language, of one syllable, which, by taking away the two first letters, becomes a word of two syllables ?
10. Which is the left side of a plum-pudding ?
11. Why are children at the breast like soldiers on a campaign ?
12. What thing is that which is lengthened by being cut at both ends ?
13. Why is a horse in a stable like a tortured criminal ?
14. What word of five syllables is that, from which, if you take one syllable away, no syllable remains ?
15. What burns to keep a secret ?
16. Why is a stormy, windy day, like a child with a cold in its head ?
17. What word is that, to which, if you add a syllable, it will make it shorter ?
18. Why should boiled peas of a bad color be sent to Knightsbridge ?
19. Where did Noah strike the first nail in the ark ?
20. Why is a tailor like a woodcock ?
21. Why is a pack of cards like a garden ?
22. Why do we all go to bed ?
23. Why is a lottery-office-keeper like Lord Lyndhurst ?
24. Why was Titian's fat daughter, Mary, like William Cobbett ?



CONUNDRUMS.

231

25. If you give a kiss and take a kiss, what does it make ?
26. In which month do ladies talk least ?
27. Why is a man who is making cent. per cent. by trade like Ireland ?
28. Why is a town in Essex like a noisy dog ?
29. Why is Paris like the letter F ?
30. What town in Devonshire will denote a woman making a wry face ?
31. Why is a man sailing up the Tigris, like one putting his father into a sack ?
32. Why does the eye resemble a schoolmaster in the act of flogging ?
33. Why is a room full of married folks like an empty room ?
34. Why is an angry person like a loaf ?
35. Why is a placeman like a cobbler ?
36. Why is a peach-stone like a regiment ?
37. Why is a dwarf's whole suite like a pair of breeches ?
38. Why is a dancing master like a cook ?
39. Why is money like a whip ?
40. Why is a man, who runs in debt, like a clock ?
41. What question is that to which you must answer "Yes ?"
42. If you throw a man out of a window, what does he first fall against ?
43. Why is an island like the letter T ?
44. When is a door not a door ?
45. Why is a tree-hive like a spectator ?
46. Why is a tale-bearer like a brick-layer ?
47. Why is a Welshman, on St. David's day, like a foundering vessel ?
48. What is that which a coach cannot move without, and yet is not of the least use to it ?
49. Why is a man in love like a lobster ?
50. When is a man over head and ears in debt ?
51. What is smaller than a mite's mouth ?
52. Why is the soul like a thing of no consequence ?
53. Why is a handsome woman like bread ?
54. What stuff is that, the more of which is taken, the fuller the box is ?
55. Why is the wick of a candle like Athens ?
56. Why is a fender like Westminster Abbey ?



65. Why is sealing-wax like a soldier ?
66. If I buy four books for a penny, and give one of them away why am I like a telescope ?
67. Why is a man lod astray like one governed by a girl ?
68. Why is a clergyman's horse like a king ?
69. What is that which makes every one sick but those who swallow it ?
70. What kin is that child to its own father who is not its father's own son ?
71. What is that which is often brought to table, always cut, and never eaten ?
72. Why is a dejected man like one thrown from a precipice ?
73. Why is a Jew in a fever like a diamond ?
74. Why are fixed stars like pens, ink, and paper ?
75. Why is a jest like a fowl ?
76. Why is a man in a gurreet committing murder like a good man ?
77. What relation is your uncle's brother to you who is not your uncle ?
78. Why should ladies wringing wet linen remind us of going to church ?
79. What is that which lives in winter, dies in summer, and grows with its root upward ?
80. Why is an avaricious man like one with a short memory ?
81. Why is a man walking to a town like one endeavouring to prevent a blow ?
82. Why is the sun like a man of fashion ?
83. Which is the heaviest, a bargeman or a lighterman ?
84. Why is a blacksmith's apron like a duenna ?
85. Why is a lady embraced like a pocket-book ?
86. What step must I take to remove the letter A from the alphabet ?
87. Why are there three objections to a glass of spirits ?
88. Why do cats see best in the dark ?
89. A man would drink a glass of wine, and not let it go down his throat—how could he do it ?
90. Why is a man beating a boy for telling a falsehood, like another playing on a certain musical instrument ?
91. Why is a cook like a barber ?
92. Why is a man opening oysters like Captain Cook firing on the savages ?
93. A farmer meeting Jack Ketch, asked him the difference between their occupations, which he gave in one word :—what is that word ?
94. What is that which is always invisible, yet never out of sight ?
95. Why is Alderman B's belly like the street he lives in ?
96. Why is the devil riding on a mouse like one and the same thing ?
97. Why is a pair of trowsers, too big every way, like two populous towns in France ?
98. What word in the English language expresses the following question :—“ Are you a reserved man ? ”



CONUNDRUMS.

239

99. Why is a waiter like a race-horse ?
100. Why is a dandy like a haunch of venison ?
101. Tom went out, and his dog with him, he went not before, behind
nor on one side of him :—then where did he go ?
102. Why is a madman like two men ?
103. What is a man like that is in the midst of a river and can't swim ?
104. Why is a lady curling her hair like a housebreaker ?
105. Why is a lady in her shift like Amsterdam ?
106. Why is a fish-book like a badger ?
107. Why is a man in a fever like a burning candle ?
108. Why is your hat, when it is on your head, like a giblet-pie ?
109. A carpenter made a door, but it was too large ; he cut it, and cut
it too little ; he cut it again, and made it just fit.
110. Why is a good story like a parish bell ?
111. Why is Chancery Lane like your eye ?
112. What most resembles a cat in a hole ?
113. If a man shame hanging himself, why does he resemble a conjuror ?
114. In what place did the cock crow, when all the world could hear
him ?
115. Why does a brunette's face resemble a wet day ?
116. You are requested to ask the following question in one word :—
"Are you the person ?"
117. Why is a man moping from morning till night like a favorite
clown ?
118. What animal is that, who, in the morning, goes upon four legs ; in
the afternoon, upon two ; and in the evening upon three ?
119. Why is a conundrum like a monkey ?
120. Why is Mr. McAdam like one of the seven wonders of the world ?
121. What smells most in a doctor's shop ?
122. What do we all do when we first get into bed ?
123. What is the weight of the moon ?
124. Why is St. Paul's like a bird's nest ?
125. Why do pioneers march at the head of regiments ?
126. What river is that which runs between two seas ?
127. What sea would make the best bed-room ?



132. Why is a speech delivered on the deck of a man-of-war if
ady's necklace?
133. Why is a lady in a sedan like the equator?
134. Why is a tallow-chandler the most vicious and unfortunate of men?
135. Why is Ireland likely to become very rich?
136. Why is a Chinese city like a man looking through a key hole?
137. Why is Liverpool like benevolence?
138. What two letters make a county in Massachusetts?
139. Why is the Prince of Wales like a cloudy day?
140. Did you ever see the elegy on a Turkey?
141. The figures representing my age, are what you ought to do in all
things. How old am I?
142. What foreign letter makes the title of a noble lady?
143. Why is London like the letter E?
144. Why is a good tavern like a bad one?
145. Why is an angry man like a lady in full dress?
146. Why is a thread-bare coat and a person too soon awakened, similar
to each other?
147. Why are deep sighs like long stockings?
148. What occupation is the sun?
149. Why are your eyes like stage-horses?
150. Why are your teeth like verbs?
151. Why is a tattler unlike a mirror?
152. Why is an andiron like a yard stick?
153. What word makes you sick, if you leave out one of its letters?
154. Why is A like a honeysuckle?
155. Why is gooseberry pie like counterfeit money?
156. What word of ten letters can be spelled with five?
157. What class of people have a name, which means "I can't improve?"
158. Why is a man who walks over Charlestown bridge, like one who
says. "Yes?"



ENIGMAS

241

170. Decline Ice cream.
171. From what motive does a fisherman blow his horn in the market?
172. How can you take one from nineteen, and leave twenty?
173. Which side of a pitcher is the handle?
174. Why is a furnace for powder like the letter S?
175. Spell Elder-blow tea, with four letters.
176. Why is a little green musk-melon like a horse?
177. Why is an industrious girl like a very aged woman?
178. Why are Protestants like flies?
179. Why was the Irish riot, at South Boston, like General Washington?
190. Why is a tailor like one who resides in the suburbs of a city?
191. Spell the Archipelago in three letters?
182. If the letter D were never used more, why would it be like a dead man?
183. Why is grass like a mouse?
184. Why do white sheep furnish more wool than black ones?
185. According to the laws of retaliation, what right have you to pick a painter's pocket?
186. What two species of falsehood are in the last novel by the author of Redwood?
187. Why has Mr. Timothy More, since he lost his hair, become like one of our southern cities?
188. Why is an avaricious man like one with a short memory?
189. A backgammon table contains the garden of Eden; does it not?
190. Describe a cat's clothing botanically?
191. Why are the eye-brows like mistakes?
192. Why should there be a marine law against whispering?
193. What kind of portrait can you spell with three letters?
194. What river in England is what naughty girls do?
195. Why is an Irishman turning over in the snow like a watchman?
196. How can a man live eighty years, and see only twenty birth days?

ENIGMAS



'Twas allotted to man from his earliest breath,
It assists at his birth, and attends him in death;
Presides o'er his happiness, honor, and health,
Is the prop of his house, and the end of his wealth;
In the heap of the miser 'tis hoarded with care,
But is sure to be lost in his prodigal heir;
It begins every hope, every wish it must bound;
It prays with the hermit, with monarchs is crown'd;
Without it the soldier and seaman may roam,
But wo to the wretch that expels it from home;
In the whispers of conscience 'tis sure to be found,
Nor e'en in the whirlwind of passion is drown'd;
'Twill soften the heart, though deaf to the ear,
'Twill make it acutely and constantly hear;
But, in short, let it rest; like a beautiful flower,
(Oh! breathe on it softly,) it dies in an hour

2.

In a garden there strayed
A beautiful maid,
As fair as the flowers in the mora
The first hour of her life
She was made a wife,
And she died before she was born

3.

Without a bridle or a saddle,
Across a thing I ride a-straddle,
And those I ride, by help of me,
Though almost blind, are made to see

4.

I've seen you where you never were,
And where you ne'er will be;
And yet within that very place,
You shall be seen by me.

5.

A shining wit pronounced, of late,
That every acting magistrate
Is water in a freezing state.

6.

Form'd long ago, yet made to-day,
Employ'd while others sleep;
What few would ever give away,
Or any wish to keep.



ENIGMAS.

243

7.

A word of four syllables seek till you find,
That has in it the twenty-four letters combin'd

8.

Form'd half beneath and half above the earth,
We, sisters, owe to art a second birth ;
The smith's and carpenter's adopted daughters,
Made on the earth to travel o'er the waters.
Swifter we move, as tighter we are bound,
Yet neither touch the water, air, nor ground.
We serve the poor for use, the rich for whim,
Sink when it rains, and when it freezes, swim

9.

I'm rough, I'm smooth, I'm wet, I'm dry ;
My station low, my title high ;
The king my lawful master is ;
Us'd by all, though only his.

10.

There is a thing was three weeks old,
When Adam was no more ;
This thing it was but four weeks old,
When Adam was fourscore.

11.

We are two brothers, born together, who seldom touch the earth, though
we often go to the ground ; although we never eat fodder, buy, sell, or bar-
ter, we may be said to be interested in the corn laws.

12.

Never still for a month, but seen mostly at night.

13.

In spring, I am gay in my attire ; in summer, I wear more clothing than
in spring ; in winter, I am naked.

14.

In camps about the centre I appear :
In smiling meadows seen throughout the year ,
The silent angler views me in the streams,
And all must trace me in their morning dreams ;
First in each mob conspicuous I stand,
Proud of the lead, and ever in command ;



Without my power no mercy can be shown,
Or soft compassion to their hearts be known;
Each sees me in himself, yet all agree
Their hearts and persons have no charm for me;
The chemist proves my virtue upon ore,
For, touch'd by me, he changes it to more.

15

I am a character well known in England; and there are few, either high or low, rich or poor, but know my name and qualifications. As I confess myself a stranger to beauty and innocence, in the fair sex I can never appear. I avoid towns and cities, and commonly take my abode towards the extremity of a village. In respectable society I am never admitted, but in a gang of gypsies or beggars make a principal figure; and without me smuggling would be nothing. I cannot well show my face in day-time, but late in the evening, or middle of night I appear, and always in disguise. I am fond of gaming, though I must own, whatever company I am in, never fail to end in cheating and plundering. It is the opinion of Burn and Blackstone, that I should always be put in jail: but, be that as it may, my fate is certainly not to be there at present. From the character I have given of myself, and the company I keep, you may suppose me some thief or pick-pocket; but, as a proof that I am neither, I delight not in a crowd; and, as a further hint, I no sooner appear before one, than it is instantly gone.

16.

I am rough, smooth, hard, soft, long, short, round, flat, oval, square, or oblong. Am now honored with the grasp of a monarch, and now in the hand of him who executes the meanest office. I possess the art of pleasing in a very eminent degree. Am now the delight of the idle bean, and now assist the skilful artist. My station is ever varying: I am now thrown carelessly in a corner, now put into the mouth, now in the pocket, and now under the grate. I will only add, that every room is indebted to me for its chief ornament.

17,

I am no monarch, but am superior to all of them, except the Pope; I have no noble blood in my veins, yet the meanest of my family has precedence



apartment where no eye was ever suffered to intrude. Perhaps you will think me a ghost, or at least a conjurer, if I tell you, that to-day I am in a thousand places at once, and to-morrow (as far as you know) I am nowhere; now I am in a room, soon after I am not there; again I appear, yet the doors and windows are all shut. With all this dignity, valor, and address, 'tis no wonder, if, like other military beaux, I am a great favorite with the ladies; as soon as they see me, they embrace me with delight, but are very cautious of keeping our connexion a profound secret; yet such is the capriciousness of the sex, that in a little time they discover it themselves, and part from me with as much pleasure as they met me. However, this separation is no disgrace; for they hope to have me again, and count me their highest honor; should I decline visiting them for a whole night, even the modest heart would be discomposed; and the more violent and indiscreet would utter their displeasure in complaints to their neighbours: but this attachment is no wonder, for, like themselves, my countenance is sometimes a lively mixture of the lily and the rose; like them, too, I am changeable, and, in the space of a few minutes, grow black in the face; yet my consequence is not lessened, but sometimes increased; and, in a little time, I generally resume my former complexion.

It may be of some advantage to me with the ladies, that I sometimes resemble that part of their dress, of which they are most vain; and, at other times, that part, the obtaining of which is the end for which they dress, and the object of their wishes. Let these ladies look to their own bosoms to discover me, but in an open manner; for no trick opposed to me ever succeeded, and I believe none ever will.

18.

He that in music takes delight,
And he that sleeps secure by night,
And he who sails too near the land,
And he that's caught by law's strong hand;
He who his time in taverns spends,
And he that courts of law attends;
He that explains heraldic signs,
And he that works in silver mines,—
Are all acquainted well with me:
My name you surely now must see.

19.

In Sir Walter Scott's celebrated poem, called "*Marmion*," are the following lines:

"Charge, Chester, charge! On, Stanley, on!
Were the last words of *Marmion*."



These lines have occasioned the following enigma.

Were I in noble Stanley's place,
When Marston urged him to the chase,
The word you then might all decry,
Would bring a tear to every eye.

20.

A lady in prison received an animal as a present from her niece, which signified to her "Make your escape;" in reply she sent back a fruit which imported "It is impossible to escape." What was the animal, and what was the fruit?

REBUSSES.

1.

To three-fourths of a cross, add a circle complete;
Then, let two semi-circles a perpendicular meet;
Next add a triangle that stands on two feet;
Then, two semi-circles, and a circle complete.

2.

A hundred and fifty, if rightly applied,
To a place where the living did once all reside,
Or a consonant joined to a sweet singing bird,
Will give you a name that you've oftentimes heard;
Which 'mong your friends, at least, one person owns
It's the rival of Smith, and as common as Jones.



11. A famous French dancer.
12. One-fourth of what a lover gives his mistress, a measure, and a vowel.
13. A measure, a vowel, and four-fifths of a weight used in Smithfield.
14. A numeral, the French for A, and the refuge of a wild beast.
15. The usual distinction of a Scotch name, and what we should always be to do a good action.
16. The fourth of a sovereign, and five-sevenths of an age of terror.
17. A female Christian name, and three-fourth of the reverse to soft.
18. A trade.
19. A word implying distance, and three-fourths of a small bird.
20. A preparer of estates and a vowel.
21. An exclamation of the ghost in Hamlet, and a preposition.
22. A vowel, and four-fifths of the safe-guards of a prison.
23. A consonant, and a portion of the earth.
24. A production of the pastry-cook.
25. Four-sixths of traffic, and a liquid made with pearl-ash.
26. A Hebrew measure.
27. A tool used to take off coach-wheels.
28. A famous river on the continent, and what we all wish to be.
29. What most young ladies try to obtain, preceded by a consent.
30. An abbreviation for Harry, part of the earth, and a vowel.
31. An Irishman's nick-name, and the reverse to off.
32. Two thirds of a lively color, and the mother of mankind.
33. An English city : or, a box, and two-thirds of to do wrong.
34. What we rub our feet on, and what the woodman does when he cuts down a tree.
35. One of the points of the compass.
36. A fruit, and what your father is, and your mother is not.
37. The initials of his majesty, two-thirds of what the inhabitants of Bedouan are, and a Spanish title.
38. Four-fifths of the earth in a dead language, and the penultimate letter of the alphabet.
39. Part of a ship, and two-thirds of an eye.
40. What the ambitious wish to possess.



Thirteen words will appear, though all ending the same,
 As various in sense, as they can be in name.
 First a place must be found, where brave tars oft retreat,
 When the wind, in a storm, makes the waves o'er them beat;
 The first letter exchange, as a song 'twill appear;
 Then exchange it again, 'tis a part of the year;
 Now it's lively and brisk, the next place to possess;
 Then gives name to a pole, in its holyday dress;
 Next the produce of earth, when for food 'tis prepared;
 Then a chattering thing, to a magpie compared;
 For brightness and glory, now see it far famed;
 Whatsoe'er I allege, the next word will be named;
 A denial, alas! too, it sometimes must be;
 May it never be so, when the next's due to me;
 A famed Scottish river, its assistance must lend;
 Last, a road's to be found, bringing us to the end

46.

Since, gentle reader, in this our **RIDDLER**, thou hast often seen represented various characters,—the grave and gay, the lively and severe,—lo! now we lead thee to a gallery, where poets and philosophers, high famed in classic page, stand ranged before thy admiring view! Full fifteen hundred years have now elapsed, since on the world these luminaries shone. Survey them closely; scan their history; avoid their faults, and emulate their virtues.

Behold that figure, reeking like a Bacchanal!—See how his swollen eyes and bloated cheeks bespeak the temper of his body. Hark!—he recites an ode: the honied strains drop from his pen, while reason holds possession of his mind!—How sweet, how elegant the poetry!—But, alas! his subject and his state too well agree. Ah! shame to see such talents so abused.

Next view the Samian Sage: observe his stature:—every joint and every limb denotes the strength that he possesses:—but could his mind be seen by mortal eye, 'twould seem still more gigantic. Observe his dress; how simple!—Humility his garb, and modesty his chief adornment! Although his friends would willingly have called him "the Wise Man,"—that title he refused; and chose the appellation of "the Friend of Wisdom." But, great as was this teacher, a little child, in this most happy and enlightened land, might teach him wisdom that he ne'er could reach.

But, lo! the Theban General appears, laden with spoils, his brows full crowned with laurel, and his garments red with the slaughter of the vanquished foe. What field has witnessed this great conquest, and who are the



REVISERS.

249

sufferers ? Leuctra beheld the fate of Sparta's sons, and streams of blood defiled her pleasant plains.

Behold Eunomus' son, the Sage of Lacedæmon. His lowering aspect and contracted brows seem indications of the sanguinary disposition of his mind. His laws forbade the use of gold and silver, and substituted iron :—so far 'twas good, to stop the progress of voluptuousness, and obviate temptations to dishonesty ;—but Nature shrinks, and Cruelty herself draws back with horror, when she beholds infants, unstained with any actual crimes, doomed by unbending policy to premature destruction.

Next view the Spartan Sculptor. The rumor of his skill had reached the ears of " Philip's warlike son : " the conqueror of the world forbade any other hand to carve his martial features on the stone. In the great Augustan age, his statues' worth was rated at their weight in gold.

But see the Poet of Salamis ; whose natal day was ushered in with shouts of victory, and with songs of triumph :—when Xerxes and his numerous host sustained a dire defeat, and felt the punishment so justly due to pride and to ambition. No warrior he, yet did his magic verse obtain the freedom of those Greeks, who groaned beneath the Syracusan bandage.

Now, to complete this " motley group," see, tripping " on the light fantastic toe," a sprightly Damsel. Famed Lesbos gave her birth ; but she, more famed for beauty and for wit, has far excelled her sex in poetry. The happy verse in which her numbers flowed, still bears her name. But, alas ! her breast became the seat of every passion : and thence flowed the poison that tainted all her compositions :—else were that judgment just, that ranked her among the Muses.

Here, reader, pause ; and call to y^e these names ; of each then take the initials, and in due order range them. Then will appear the Ephesian Artist ; whose excelling skill has far surpassed the united brilliancy and majesty of Rubens and of Raphael.

47.

Find the thing by Pandora sentail'd on mankind.



As a farmer's employment it next will appear ;
And a thing to your door you will find very near ;
What the doctors oft give, to relieve us from pain ;
And a plant we now look for in gardens, in vain ;
What I bid my friend do when I give him a toast ;
And a place much frequented by knights of the Post ;
A short name that's well known in a nursery song ;
And what runs through a country for many miles long ;
What's the aim of a sportsman, pursuing his game ;
What we style a neat box, or a township's short name ;
And then all your labor will nearly be over,
And a double head's all you have left to discover,
For one, being mute, a companion and friend,
Must forever stand by, its assistance to lend ;
In revealing what's common to birds and a beast,
And whose use to us scribblers is none of the least.

48.

Reverse a snug apartment, and you'll find
A dreary marsh presented to your mind.

49.

Now to your enigmatic eyes,
Behold six worthies shall arise,
From their initials to compound
A modern poet, much renowned
First in the list we enter thee,
Father of English poetry :
Next thee, of Scotia's bards the first ;
Thy muse from darkest ages burst
Next thee, philosopher divine,
And poet,—all the praise is thine ;
'Twas thine the sweetest notes to raise
From David's harp, in British lays :
Thee, Theban bard, whose rapid fire
Succeeding ages still admire ;
While a vain modern, grasping fame,
Profanes thy venerable name :



REBUSES

25:

With thee, at last, the verse shall shine,
The prince of painters, styled "divine ;"
A sovereign pontiff knew thy worth,
And old Urbino claims thy birth.

50.

Two letters, expressing profusion and waste,
Transposed, show a county to most people's taste

51.

A modern bard of universal fame ;
A classic river's oft-repeated name ;
A naval hero dear to ev'ry heart ;
A ruthless tyrant with a murd'rous dart ;
An English author, famous for his style ;
A poet who our leisure may beguile :
Th' initials join, an ancient bard you'll find,
Who to his verse has left his name behind.

The following are Rebuses on the Names of Birds

- 52. A child's plaything.
- 53. What we all do at every meal
- 54. A disorder incident to man and horse.
- 55. Nothing, twice yourself, and fifty.
- 56. What we should always be ready to do to persons fighting, and the
op of a house.
- 57. Equality and decay.
- 58. A celebrated English architect.
- 59. A tailor's implement.
- 60. A lever.
- 61. An instrument for raising weights.
- 62. Three-eighths of a monthly publication, with a baked dish
- 63. A valuable species of corn, and a very necessary part of it
- 64. A cheated person.
- 65. A distant country.
- 66. Spoil half a score.
- 67. The defence of a bridge.
- 68. An instrument of diversion for men and boys.
- 69. A piece of wood, and a fashionable name for a street.
- 70. To cut off, and a vowel.
- 71. A piece of land, and a good thing which it produces.
- 72. What we say a person has got when he falls into the water.
- 73. An Animal which a Jew must not eat, a vowel, and a preposition



74.

I am found in a jail; I belong to a fire;
And am seen in a gutter abounding in mire:
Put my last letter third, and then 'twill be found
I belong to a king, without changing my sound.

75

Ye rebus wits,
Now mind your hits;
For your's the task
My name to unmask:
A fruit we eat,
As sauce to meat;
And with fish too,
That wants a *gout*;
One letter, pray,
Take quite away;
A point of land
You'll understand,

Which sailors dread
Too near their lead,
But when embay'd,
Enjoy its shade:
One more letter
Then unfetter,
The thing that's left,
When thus bereft,
Is worn by all,
Both great and small,
From king and queen
To beggar mean.

ANAGRAMS.

1. Ten tea pots.
2. Sly Ware.
3. It's in charity.
4. Golden land.
5. Great helps.
6. Rare mad frolic.
7. Honor est a Nilo
8. Hard case.
9. Claims Arthur's seat.

20. Spare him not
21. Real fun.
22. In Magic tale
23. Evil fast.
24. Yes Milton.
25. 'Tis ye governa.
26. See a pug dog.
27. A just master.
28. Made in mint notes



LOGOGRIPHS.

1.

A creature was formerly seen in England, which has lately been expelled from it, and which has some very peculiar properties appertaining to it. I. stands upon one leg,—on which, without any body, is seen a great square head. It has three eyes, of which the centre is by far the largest; indeed, so much so, that it has before now contained two more. The head is of a very peculiar construction, but exactly suited to its design: whenever it is about to be used, it is separated in halves, and, when reconnected, is held up to the gaze of an insolent rabble. All the notice, however, which it generally attracts, results from its being the effectual means of exhibiting another to the gaze of a hostile crowd. Such is this when entire; but when divided, and cut to pieces, a curious and careful observer may collect all that follows, by a selection and appropriate arrangement of its fragments.

A dose of medicine conveyed in a very agreeable manner, as, however nauseous its ingredients may have originally been, it is quite tasteless. Such a state of the physical powers as requires such a dose. A part of the face, of a color quite different from the rest, and the more handsome, the greater the difference. A public record on which many are very anxious to get their names entered; or, to descend from great things to small, a substance that is devoured every morning for breakfast. A river which flows through a very delightful and agreeable part of Europe. What curious people are very fond of doing. What a candidate, for your vote at the next general election, if he should think it worth his while, will demand. A very poetical portion of the watery element, which murmurs and meanders in the description of many a poetaster. A quality of resinous substances. A female nickname. What is very necessary to be done occasionally in your shrubbery. An exclamation of surprise. A flower displaying more to admire than Solomon in all his glory. The same. The annual dinner of citizens. and in



One time as white as snow I'm seen,
Another, red, blue, yellow, green ;
The friendly brown I also wear,
Or in a sable garb appear :
The rhetorician owns my power,
For though well dressed with many a flower
His florid speech would gain no praise,
But, losing me, contempt would raise.
But now my name you surely know,
Dissected in the lines below.
That power to which we all must bend ;
And what we call a valued friend ;
A goddess of revengeful fame ;
And Abram's near relation's name ;
Two articles in common use ;
And what we oft complain of news ;
A weed which grew upon the plain,
Suffer'd till harvest to remain ;
Two quadrupeds will next appear,
Which both conduce to sport and cheer ,
A third, a noxious little creature ;
And what adds charms to simple nature ;
A fruit ; a color ; and a date
A firm support of Britain's state ;
What high, yet low, we wish to be ;
A term for one who goes to sea ;
One thing another oft put over ;
Two things by this you may discover,—
To make my hint somewhat more plain,
One keeps the other from the rain ;
The vital spring of every joy ;
And every pleasure that we know ;
What's always done whene'er we walk ;
And what we do when others talk ;
With what we've done when they give o'er
Two notes in music next explore ;
What, join'd to *home*, is sent about,
As invitation to a rout ;
What oft we see upon the plain ;
Two little words denoting pain,
Or quick surprise, or laughter vain
A sign of sorrow ; mark of spirit ;
What envy bears superior merit ;



A fragrant shrub we oft infuse ;
Two pronouns in most frequent use ;
A passion which the envious feel ;
A weapon pointed oft with steel ;
One of the properties of stone ;
A term 'or misanthrope well known ;
What oft in summer months we feel ;
What aids when secrets you reveal ;
What sinful deeds should ever be ;
What's daily done by you and me.
If all these meanings you expound,
Just five and forty will be found.

3.

I was before the world began,
Before God made the rising sun ;
Before He made the lesser lights
To drive the darkness from the night
I'm at the bottom of the sea,
And I am in immensity ;
The daily motion of the earth
Dispels me, and to me gives birth ;
You cannot see me if you try,
Although I'm oft before your eye.
Such is my whole. But for one part
You'll find in taste I'm rather tart ;—
Now I become th' abode of men,—
And now for meaner things, a pen ;
I am a man who lives by drinking,—
Anon I keep a weight from sinking ;
To take me, folks go far and near,—
I am what children like to hear ;
I am a shining star on high,
And I'm its pathway through the sky ;
I take the strength from iron and steel,—
Am sometimes left behind a wheel ;
I am a term of due respect,—



4.

The man of letters finds me in his books ;
The angler by the side of babbling brooks ;
The sportsman seeks me with his dog and gun
In foreign lands the traveller thinks I'm won ;
The spendthrift hopes to buy me with his gold ;
And childhood has me when a tale is told ;
The love of me decoys the giddy youth,
From useful studies, till he learns this truth,
" All those who seek me *only*, most I fly ;"
Lastly, when you my hidden sense descry,
You'll own that for my sake you pondered long
The countless changes, that to me belong.
Such am I as a whole—but for *one* part,—
The youth invokes me when he feels love's dart ;
The Swiss, when exiled from his native vales,
Hears me with anguish, and his fate bewails ;
New zest I add to scandal's busy hour ;
And adverse winds and tides confess my power *
I am the dazzling source whence colors flow ;
The sluggard's teacher ; and your equal now ;
Without me sails were useless ; then a word
Expressing like ; and now meek woman's lord ;
To measure next ; anon to add ; to vex ;
The gentle office of the weaker sex ;
I'm flesh, not fish—I'm silent ever ;
Sought by all ranks, on earth found never ;
Your near relation, and the squirrel's food ;
What you would keep when in a lazy mood ;
Neptune's abode : the forest monarch's pride ;
A term to the departed souls applied ;
What you possess, but others oftener use :
Your coat must have me, spite of what you choose
Now the soft clime of " the cedar and vine ;"
And last, a short word importing new wine.
More could I tell, but I bid you adieu,
Lest by prating I cause my own loss to you.



SOLUTIONS

95*

SOLUTIONS

CHARADES.

- | | |
|-------------------|------------------------------|
| 1 Hour-glass. | 18 Corn-wall, famous for its |
| 2 Fur-port. | T I N (tea-eye-ben.) |
| 3 Milk-maid. | 19 Mis-take. |
| 4 Flint-shire. | 20 Ear-wig. |
| 5 Snuff-box. | 21 Pat-ten. |
| 6 Wood-bine. | 22 Ever-lusting. |
| 7 Gad-fly. | 23 Watch man. |
| 8 Lup-pet. | 24 Snow-ball. |
| 9 Worm-wood. | 25 Pine-apple. |
| 10 Pip-kin | 26 May-pole. |
| 11 Fox-chase. | 27 Draught-board. |
| 12 Canillo-stick. | 28 Heat-ben. |
| 13 Bar-eky. | 29 Leap-frog. |
| 14 Hammer-smith. | 30 Side-Walk. |
| 15 Foot-stool. | 31 Name-less. |
| 16 Counter-pana. | 32 Cross-patch |
| 17 Waist-coat. | |

CONUNDRUMS.

- | | |
|--|--|
| 1 She weighs anchor. | 19 On the head. |
| 2 He's not at all (<i>tall black</i>) black. | 20 He has a long bill |
| 3 It has many laws (<i>Menelaus</i>) in it | 21 There are spades in it. |
| 4 It's placed between two I's (<i>eyes</i>) | 22 The bed will not come to us. |
| 5 It is <i>Aeneid</i> (<i>in-kneed</i> .) | 23 He is a chance-seller—(<i>Chancellor</i> .) |
| 6 A mare's. | 24 She was a great Polly Titian—(<i>politician</i> .) |
| 7 Misfortune (<i>Miss-fortune</i> .) | 25 A re-bus. |
| 8 A bed. | 26 In February, because it is the shortest. |
| 9 Plague—Ague. | 27 His capital is doubling (<i>Dublin</i> .) |
| 10 That which is not eaten. | 28 It is Barking. |
| 11 They are in arms. | 29 It is the capital of France. |
| 12 A ditch. | 30 Cockermouth (<i>cock her mouth</i> .) |
| 13 He is tied to the rack. | 31 He is going to <i>Bag-dad</i> . |
| 14 Monosyllable—no syllable. | 32 It has a pupil under the lash. |
| 15 Sealing-wax. | 33 There is not a single person in it |
| 16 It blows, it snows—(<i>it blows its nose</i> .) | 34 He is crusty. |
| 17 Short—shorter. | 35 He sticks to the <i>last</i> |
| 18 It is the way to Turnham-Green —(<i>turn 'em green</i>) | |



- 36 It has a kernel—(*colonel*.)
37 They are small clothes.
38 He cuts *capers*.
39 It makes the mare to go.
40 He goes on *tick*.
41 What does Y, E, S spell?
42 Against his inclination.
43 It is in the midst of water—
 (*wa-t-er*.)
44 When it is a-jar—(*a jar*.)
45 It is a bee-holder—(*beholder*.)
46 He raises stories.
47 He carries a leak—(*leak*.)
48 Noise.
49 He has a lady in his head.
50 When he has a hat on that is not
 paid for.
51 His tongue.
52 It is immaterial.
53 She is often toasted.
54 The snuff of a candle.
55 It is in the midst of grease—
 (*Greece*.)
56 It contains the ashes of the grate
 —(*great*.)
57 It is next to Kew—(*Q*.)
58 He is cur-led—(*curled*.)
59 A medlar—(*meddler*.)
60 She is a cat erect—(*cataract*.)
61 He makes shifts.
62 It is a certainty—(*certain tie*.)
63 They are sham pinions—
 (*champignons*.)
74 They are stationary—(*station-
 ery*.)
75 It contains a merry thought.
76 He is *at-oss* committing a bad
 act.
77 Your father.
78 The belles are wringing (*ring-
 ing*.)
79 An icicle.
80 He is always forgetting—(*for
 getting*.)
81 He is going toward it—(*to
 ward it*.)
82 It turns night into day.
83 A bargeman.
84 It keeps off the sparks.
85 She is clasped.
86 By B heading it—(*beheading it*)
87 Because there are three scruples
 to a dram.
88 They eat *lights*.
89 By standing on his head and let-
 ting it go up his throat.
90 He is striking a liar—(*lyre*.)
91 He dresses hure—(*hair*.)
92 He's astonishing the natives.
93 Utility—(*you till, I tie*.)
94 The letter I, which is always in
 visible.
95 It's widened at the expense of
 the corporation.
96 He is sin-on-a-mouse—(*synon-
 ymous*.)



SOLUTIONS

256

- | | |
|---|--|
| <p>105 She's in Holland.
 106 It is often baited.
 107 He's light-headed.
 108 There's a goose's head in it.
 109 He cut it too little, i. e. he did not cut enough of it.
 110 It often tolled—(<i>told.</i>)
 111 It is near the Temple.
 112 A cat out of a hole.
 113 He is a neck-romancer—(<i>necromancer.</i>)
 114 In Noah's ark.
 115 It is not fair.
 116 R, U, E—(<i>Are you he?</i>)
 117 He's grim all day (<i>Grimaldi.</i>)
 118 Man : viz. In the morning of his life, on all fours; in the afternoon, on two; and in the evening, with a stick.
 119 It is far-fetched and full of nonsense.
 120 He is the colossus of roads—(<i>Rhodes.</i>)
 121 The nose.
 122 Make an impression.
 123 Four quarters.
 124 It was built by a Wren.
 125 Toaze the way.
 126 The Thames, which flows between Chelsea and Battersea.
 127 Adriatic—(<i>a dry attic.</i>)
 128 Water in and ice out.</p> | <p>129 Because its capital is always Dublin (<i>Doubling.</i>)
 136 It is Pekin (<i>Peeking.</i>)
 137 It is founder on Mercy (<i>Mercy</i>)
 138 S. X. (<i>Essex.</i>)
 139 He is likely to reign (<i>Rain.</i>)
 140 Did you ever see the leg on Turkey? (<i>Leg.</i>)
 141 I am XL. (<i>Excel.</i>)
 142 Dutch S (<i>Dutchess.</i>)
 143 It is the capital of England.
 144 Both inn convenient.
 145 He is ruffled.
 146 They have lost their nap.
 147 Heigh-ho (<i>high hose.</i>)
 148 A Tanner.
 149 They are a'ways under lashes.
 150 Regular, irregular, and defective.
 151 One speaks without reflecting the other reflects without speaking.
 152 It has three feet
 153 Music.
 154 A bee follows it.
 155 It is not current (<i>current.</i>)
 156 Expediency (<i>X P D N C E.</i>)
 157 Mendicants (<i>Mend I can't.</i>)
 158 He gives assent (<i>assent.</i>)
 159 Dandelion (<i>dandy,—lion.</i>)
 160 They carry firelocks.
 161 A full moon.</p> |
|---|--|



280

SOLUTIONS.

- | | |
|---|--|
| 171 From a selfish motive (<i>Sell fish</i>) | 186 A hopeless lie and a faithless lie (<i>Hope Leslie, and Faith Leslie.</i>) |
| 172 XIX—XX. | |
| 173 The out-side. | |
| 74 It makes hot shot (<i>Hot a-hot.</i>) | 187 He is bald Tim Moore (<i>Baltimore.</i>) |
| 175 L O O T. | |
| 176 It makes a mango (<i>Man go.</i>) | 188 They are always forgetting (<i>For getting.</i>) |
| 177 They are both notable (<i>not able.</i>) | |
| 178 They are in sects (<i>insects.</i>) | 189 Paradise is in it (<i>Pair o' dice.</i>) |
| 179 It was a Pat riot (<i>Patriot.</i>) | 190 Her suit is hairy (In botany the word <i>hirsute</i> means hairy.) |
| 180 He lives on the skirts of the town. | 191 They are over sights (<i>oversights.</i>) |
| 181 E G and C (<i>Ægean Sea.</i>) | |
| 182 It would be D-ceased (<i>Deceased.</i>) | 192 It is privatizing (<i>private earing.</i>) |
| 183 The cat'll eat it (<i>The cattle eat it.</i>) | 193 Effigy (<i>F E G.</i>) |
| 184 There are more of them. | 194 The Tees (<i>tease.</i>) |
| 185 He has pictures (<i>Picked yours.</i>) | 195 He is Pat-rolling (<i>Patrolling.</i>) |
| | 196 He was born 29th February. |

ENIGMAS.

- | | |
|--------------------------------|--|
| 1 The letter H. | 13 A tree. |
| 2 Eve. | 14 Letter M. |
| 3 Spectacles. | 15 Letter G. |
| 4 In a looking-glass. | 16 Brush. |
| 5 Justice—(<i>just-ice.</i>) | 17 Ace of Trumps. |
| 6 A boil. | 18 Bar. |
| 7 Alphabet. | 19 On-I-on, (<i>onion.</i>) |
| 8 A pair of skates. | 20 The animal sent was an antelope (<i>Antelope.</i>) The fruit returned was a cantelope (<i>Can't elope.</i>) |
| 9 Highway. | |
| 10 The moon. | |
| 11 The feet. | |
| 12 The moon. | |

REBUSSES.

- | | |
|---|---------------|
| 1 TOBACCO. | 10 Foote. |
| 5 C-L-ark; or C-lark, (<i>Clark.</i>) | 11 Vestris. |
| 3 C-him-ney, (<i>Chimney.</i>) | 12 Kelley. |
| 4 Pope. | 13 Elliston. |
| 5 Al-hot. | 14 Munden. |
| 6 Tree. | 15 Macready. |
| 7 Browne. | 16 Kemble. |
| 8 Stephens | 17 Blanchard. |
| 9 Keen. | 18 Cooper. |



SOLUTIONS

261

- | | |
|------------------------------|------------------------------|
| 19 Farrea. | mill; jill; ill; kill; vill; |
| 20 Cooke. | quill. |
| 21 Liston. | 48 Room; moor |
| 22 Yates. | 49 Cowper; Chaucer; Ossian; |
| 23 Bland. | Watts; Pindar; Erasmus; |
| 24 Bunn. | Raphael. |
| 25 Bartley. | 50 X S : S X. |
| 26 Cubitt. | 51 Pope; Illius; Nelson; |
| 27 Wrench. | Death; Addison; Rogers; |
| 28 Powell. | Pindar. |
| 29 Glover. | 52 Kite. |
| 30 Hurlande. | 53 Swallow |
| 31 Paton. | 54 Thrush. |
| 32 Reeve. | 55 OWL. |
| 33 Chester. | 56 Partridge. |
| 34 Matthews. | 57 Parrot. |
| 35 West. | 58 Wren. |
| 36 Pearman. | 59 Goose. |
| 37 Gradder. | 60 Crow. |
| 38 Terry. | 61 Crane. |
| 39 Keetley. | 62 Magpie. |
| 40 Power. | 63 Wheatear |
| 41 Ward. | 64 Gull. |
| 42 Russell. | 65 Turkey. |
| 43 Ellis. | 66 Martin. |
| 44 Roman. | 67 Starling. |
| 45 Bay; hay; day; gay; May; | 68 Bat. |
| hay; jay; say; say; nay; | 69 Sparrow. |
| pay; Tay; say. | 70 Snipe. |
| 46 Anacreon; Pythagoras; Ep- | 71 Fieldfare. |
| aminondas; Lycurgus; Ly- | 72 Duck. |
| sippus; Euripides; San- | 73 Pigeon. |



- 15 Revolution
- 16 Presbyterian.
- 17 Penitentiary.
- 18 La Revolution Francaise.
- 19 Democrutical.
- 20 Misanthrope.
- 21 Funeral.
- 22 Enigmatical.
- 23 Festival.
- 24 Solemnity.
- 25 Sovereignty.
- 26 Pedagogues

- 27 James Stuart
- 28 Disappointment
- 29 Phaeton.
- 30 Monastically.
- 31 Patience.
- 32 Breath.
- 33 Wealth.
- 34 Arthur Wellesley.
- 35 Dissemination.
- 36 Miniature.
- 37 Parishioner.
- 38 Sweetheart.

LOGOGRIPHS.

- 1 Pillory : in which may be found
pill ; ill ; lip ; roll ; Po ; pry ;
poll ; rill ; ropy ; Polly ; lop ;
lo ; lily ; rip ; oil ; only ; or ;
O. P.
- 2 Thread : in which may be
found, death ; dear ; Até ;
Terah ; the ; dearth ; tare ;
hare ; hart ; rat ; art ; a ;
date ; red ; era ; trade ;
rated ; tar ; hat ; head ;
heart ; tread ; hear ; heard ;
re ; da ; at ; herd ; ah ; ha ;
tear ; dare ; hate ; tea ; her ;
eh ; hated ; dart ; hard ;

hater ; heat ; ear ; hatred ;
eat.

- 3 Obscurity : in which may be
found, sour ; city ; sty ; sot ;
buoy ; tour ; story ; orb ;
orbit ; rust ; rut ; sir ; or ;
bust ; crust.

- 4 Amusement : in which may be
found, Muse ; tea ; stream ;
sun ; ant ; mate ; mast ;
as ; man ; mete ; sun ;
tease ; amuse ; meat ; mute ;
ease ; aunt ; nut ; seat ; sea ;
mane ; names ; name ;
seam ; east ; strum.

Thus ends our Key to the Riddler ; our young readers, we doubt not, have very frequently referred to it, in perusing the various questions and puzzles which precede it, in order to save themselves the trouble of tasking their ingenuity to discover the solutions. They ought not, however, to have recourse to the Answers, until they have made frequent attempts to solve the Riddles. Some persons cannot, without considerable difficulty, find the proper answer to an Enigma or a Rebus ; while others, of no greater general acuteness, do so with ease. It is no proof, therefore, of inferiority, not to be able to reply to a quaint Cosmadrum, so quickly as another. Many young people have displayed much ingenuity in the construction of different sorts of Riddles in rhyme,—they are, in general, the most happy in solving those of others. The admirers of these frequently amusing trifles, consider opposition in their component parts, or curious combinations, to be most essential in the construction of good Riddles



THE ANGLER



Embower'd upon the pleasant banks of Thames
Or, by the silver stream of Isis, Cam,
Or yellow Avon, roaming, the Angler,
Joyous, pursues from morn till eve his sport

ANGLING has long held a high rank among the sports of the people of England; poets have written in its praise, and philosophers have delighted in its practice; it is not confined to particular places, ages, or grades of society; wherever the brook wanders "through hazy shaw or broomy glen,"—wherever the willow-branch laves in the streamlet, —wherever the Trout leaps at the May-fly, or the Pike lurks in the bulrushes, or the Salmon springs up the waterfall,—there also are Anglers. To enjoy this fine pastime, the mountaineer descends to the valley-stream, the Magister Artium quits his learned halls and collegiate ease for the banks of the deeps, the weirs, and the tumbling bays of Cam; the citizen his shop and beloved lager for a hickory



duties attendant on such superior station, from weighing the balance of power, and determining the fate of nations, "to wield the rod, and cast the mimic fly."

RODS.

The first care of the Angler should be to procure good rods, lines, hooks, and floats. A great variety of rods may be had at the shops, of bamboo, vine, hazel, and hickory : for general fishing, those made of bamboo, having several tops of various strengths, are best ; but cane rods are much superior for fine fishing. The rod should be perfectly straight when put together, and gradually taper from the butt to the top. If you be desirous of making the rods yourself, the following directions must be observed :—The stocks should be cut in the winter ; hazel and yew switches are the best for tops, and crab-tree for stocks. Do not use them till fully seasoned, which will be in about sixteen months after they are cut ; but the longer they are kept the better. The rod should consist of five or six pieces, fitted so nicely, that the whole rod may appear as if it consisted of one piece only. The best rods are those that are brass ferruled ; but if they are bound together, it must be with thread, strongly waxed, the pieces being cut with a slope or slant, that they may join with the greater exactness. Six or eight inches must be taken from the top, and in its place a smooth round taper piece of whalebone substituted, on which a strong loop of horse-hair must be previously whipt. Fly-rods are made more taper than others. Rods for trolling must be furnished with brass rings, whipt all the way up, about ten or twelve inches distance, for the trolling lines to go through ; the tops for trolls must be strong, and have rings whipt on, with pieces of quill, to prevent the lines being cut. The tops of rods for Carp, Tench, Dace and Roach fishing, should be finer, and more elastic.

The rod must neither be kept too dry, nor too moist ; for the one will make it brittle, the other rotten. In very warm weather, always wet the joints, to make them adhere better ; if, however, by being too wet, they should stick, so that you cannot easily get them asunder, never use force, lest you should strain your rod, but rather wait till it be dry, or turn the ferrule of the joint which is fast, a few times over the flame of a candle, and it will separate.

LINES

For the line, horse-hair is to be preferred ; it should be round, twisted even, and of equal thickness. The best colors are white and gray for clear waters, and sorrel for muddy rivers. The most easy method of making lines, is by a little machine, which may be bought at most of the shops where also, you purchase your lines, if you think fit.



HOOKS.

Hooks are numbered, and made suitable in size to the fish they are intended to take. For Barbel-fishing, Nos. 5, 6, 7, 8, and 9, are used; for Gudgeons, Nos. 10 and 11; for Roach, Dace, and Bleak, Nos. 10, 11, or 12; for Tench, Carp, and Perch, Nos. 7, 8, and 9; for Trout, No. 6; for Chub, Nos. 8 or 9; for Eels, No. 8; for Grayling, No. 10; for Ruff, No. 9, for Minnows, &c. No. 13, &c. The above sizes are such as the best Anglers of the present day prefer, and are much smaller than those used formerly; but he who expects success at this sport must adopt the modern tackle, or he will be disappointed. For arming the hook, use fine, small, strong silk, well waxed, and lay the hair on the inside of the hook, otherwise the silk will fret and cut it asunder.

FLOATS.

Floats made of Muscovy-duck quills, are best for slow waters; and cork, without flaws or holes, bored through with a hot iron, into which is put a quill of fit proportion, is preferable for strong streams: the cork should be pared to a pyramidal form, ground small with a pumice-stone, and colored according to fancy. Floats must be so poised with shot, when on the line, as to make them stand perpendicularly in the water, that the least nibble may be apparent.

BAITS.

The lob-worm, garden-worm, and dew-worm, or trechet, are found in gardens and church-yards at night; those with red heads, broad tails, and streaked down the back, are the best. These worms are excellent bait for Barbel, or Eels, and are found towards the latter end of the summer.

Gilt-tails, brandlings, and red worms are found in old dung-hills, hog's dung, cow's dung, and tanner's bark. The brandling and gilt-tail are excellent bait for Perch, Tench, Bream and Gudgeon. The red worms, well scoured, are taken by Tench, Perch, and Bream, in muddy waters.

The meadow, or marsh-worm, is of a lightish blue color, and a good bait for Perch; it is found in marshy ground, or in the banks of rivers in the months of August and September.

The tag-tail is found in meadows, or chalky ground after rain, in March and April; and esteemed a good bait for Trout, in cloudy weather.

The palmer-worm, woolbed, or canker, is found on herbs, plants, as trees; and takes the name of woolbed, from its rough and woolly coat



The bark-worm, or ash-grub, is found under the bark of a felled oak, ash, alder, or beech, or in the hollow of those trees where rotten. This bait may be used all the year for Grayling, Dace, Roach, or Chub. They are kept well in wheat-bran.

The cod-bait, caddis-worm, or case-worm, of which there are three sorts is found in pits, ponds, or ditches; they are excellent baits for Bream, Tench, Bleaks, Chub, Trout, Grayling, and Dace.

Gentles, or maggots, are easily bred by putrefaction; they may be kept with flesh, and scoured with wheat-bran. They are good baits for Tench, Bream, Barbel, Pace, Gudgeon, Chub, Bleak, and Carp.

Cow-dung-bob is found under cow-dung, and somewhat resembles a gentile. It is best kept in earth; and is a good bait for Trout, Chub, Carp, Tench, Bream, Pace, and Roach.

The white-grub, or white-bait, is much larger than a maggot; it is found in sandy and mellow ground; and is an excellent bait from the middle of April till November, for Tench, Roach, Bream, Trout, Chub, Dace, and Carp. These baits should be kept in an earthen vessel, with the earth about them, and covered very close.

Flag or dock-worms are found among the small fibres of flag-roots, and in old pits or ponds. They may be kept in bran; and are good baits for Bream, Tench, Roach, Carp, Bleak, Dace, and Perch.

Boiled salmon-spawn is a very good bait for Chub, and in some rivers, for Trout.

Dace, minnows, roach, smelt, gudgeon, bleak, and miller's-thumb, are proper bait for Pike.

Grasshoppers, in June, July, and August, their legs and wings taken off, are good for Roach, Chub, Trout, and Grayling.

Cheese, or oat-cake, is reckoned killing for Chub, Barbel, Roach, and Dace; the cheese you may moisten with honey and water.

The water-cricket, water-louse or creeper, which is found in stony rivers, will often take Trout in March, April, and May.

White snails are good bait for Chub, early in the morning, and for Trout and Eels on night hooks.

House-cricket are also good, to dib with, for Chub.

TROUT.

In angling for Trout at the bottom, in the early part of the morning, and also at night, and during the day if the water be much coloured, use a



two or three sharp pulls, strike smartly; if a heavy fish, give him line, and land him at leisure, as a Trout is very strong, and struggles most violently, leaping out of the water, and flying in all directions, as soon as he feels the hook.

The Minnow is a good killing bait for Trout. In fishing with a Minnow, hook it by the lips, or beneath the back fin; use a small cork float, No. 6 hook, and let your bait swim below mid-water in deep dark holes, which are free from eddies. Trout begin to feed in March, and continue in season till June. The first two or three months are best for bottom-fishing, they are then found in shallows; in summer time, the large Trout lie in deep holes, or eddies. As they seldom feed in the day, unless in dark weather, you must fish for Trout betimes in the morning, and late in the evening, or you will not be likely to be successful in your sport.

PERCH.

The perch generally takes a bait immediately it is offered. Perch angling continues from April to October. Strong tackle must be used in angling for them, a cork float, gut line, or a twisted hair, and hook No. 7. Bait with two red worms, well scoured, or a live Minnow hooked by the lips or back fin, shrimps, or large gray maggots taken from potato or turnip plants; give them a few minutes to pouch the bait; use running tackle or you will certainly lose your fish. During the hot months, Perch feed very little; dark, windy weather, if not too cold, is best; they lie about bridges, mill-pools, near locks in rivers and canals, in deep, dark, still holes and eddies, ponds about flood gates, on the gravel or sandy parts, and near rushes. If there be any Perch about, and they are inclined to feed, they will soon take the bait, so that you need not delay long in one place.

EELS.

Eels are taken with the rod and line, night lines, dead lines, and by bobbing and snigging. When fishing with a rod, use gut, or twisted hair lines, with a float, and No. 8 hook; bait with a worm, fish at the bottom, and let the float remain a moment under water before you strike. The dead line should be made of whipcord; on which you may put five or six hooks, about nine inches apart. The night line must be strong, and baited with small worms, or lob-worms. Bobbing is practised from a boat; you must procure a large quantity of worms for this, pass a needle through them, from head to tail, and string them on worsted, until you have as many strung as will form a bunch as large as a good-sized turnip: then fasten them on the line, so that all the ends may hang level. Place a piece of lead of a conical form in the middle, cast the baits into the water, sink them to the bottom, raise them a few inches, and then drop them again until you have a bite; be as expert



and steady in raising your lines as possible, so that your fish may drop off into the boat. Immense numbers may be taken by this method.

NATURAL FLY-FISHING.

For Natural Fly-fishing, the rods should be long and slender, the lines fine, but not so long as those used for Artificial Fly-fishing; the tackle running; and the hooks short in their shanks, and well proportioned in size to the baits. By fishing with the wind at one's back, the line is wafted through the air just above the surface of the water. In streams, begin by fishing just under the banks or near the shore, and proceed by degrees, until at length you may throw your line the whole breadth of the water. In rivers, which, during the summer months, produce an abundance of weeds, you should fish between those places where the current is strongest, taking care so to manage your line as not to get it entangled. When fishing with natural flies, all the other haunts of the different fish which we have elsewhere mentioned should be frequented. Let the fly just reach the surface of the water, and go gently down the stream; the top of your rod should be a little raised, and the bait kept in motion upon the surface, by gently raising, lowering, and drawing it to and fro. When a fish takes your bait, after a moment strike smartly; and, if he be not so large as to break your tackle, lift him out immediately; for by playing with him you may, probably, scare away others. There is an immense variety of Natural Fly-fishing baits; we shall describe those only which are in most general use.

NATURAL BAITS.

Hornets, wasps, and humble-bees, are good baits for Roach, Dace, Eels, Flounders, Bream and Chub; some boil them, but it is best to dry them in an oven, or over a fire; and, if not over done, they will keep a long time. The stone-fly is found at the sides of rivers, under hollow stones; it is of a curious brown color, the body is pretty thick, and streaked with yellow on the back and belly.

The green drake is taken from May to July; it is a long, slender fly, with



about them: The fern-fly, or fern bob, is found among fern, from May to the end of August. It has a short, thick body, and two pair of wings, the uppermost reddish and hard, which may be taken off. The Chub never refuses it, and the Trout will take it very freely at the latter end of May.

The hawthorn-fly is found on hawthorn-trees, when the leaves are just shooting; it is of a black color, and is used to dith in a river for Trout.

The great moth is to be found, in the summer evenings, in gardens, trees, or plants; it is used as a bait in dithing for Rouch; it has a very large head and whitish wings.

The bonnet-fly is an excellent bait for Dace, Chub, &c; it is to be found in the summer months, among standing grass.

The ash-fly, woodcock-fly, or oak-fly, is usually found, from May till September, in the body of an oak or ash-tree, with its head downward, toward the root; it is of a brownish color. This fly is a good bait for Trout. The red copper-colored beetle is a good bait for Trout, if the hard wings be clipped off, and the fly hung with its feet toward the water.

The best mode of keeping natural flies is as follows: Procure a horn bottle made in the shape of a cone, with a wooden bottom, in which several holes must be pierced; these should be sufficiently numerous to afford the flies air, but none of them large enough to suffer your smallest bait to escape; a cork must be obtained to fit the upper or smaller end, so that you may take your baits out, one by one, without losing any. If the flies be kept in a common box, there is a great chance of half a dozen flying out every time you lift the cover.

ARTIFICIAL FLY-FISHING.

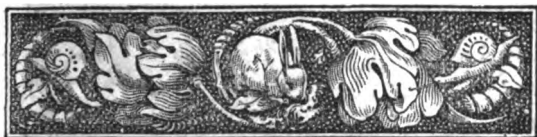
The most elegant, clean, gentlemanly, and pleasant mode of fishing is, unquestionably, with the Artificial Fly. It has many advantages over bottom-fishing;—the Artificial fly-fisher is never under the necessity of making ground-bait, digging clay, &c.—he has not even the trouble of baiting his hook; he may ramble along the banks of a pleasant stream, with no bur-



time and practice are required to make the tyro an adept in it; by theory it can never be attained; a few months' instruction, under an experienced person, will be more beneficial toward its acquirement than the perusal of all the works extant on the subject. With the preliminary part, or rudiments of the science, (for so it may with propriety be called,) the young Angler may, however, make himself acquainted, by reading the following pages; and if he will carefully attend to the hints and instructions hereinafter given on the subject, he may, with good practice, even attain considerable proficiency in Artificial Fly-fishing; but it cannot be learned so soon, or so well, from any book as from an experienced instructor.

CASTING THE LINES, &c.

Your rod for fly-fishing must be light and flexible, and of a length proportioned to your power of casting; when you have properly fixed the winch, and brought your line from it through the links, fix your fly on, and let out your line about the length of the rod, or something less; take the rod in your right hand, and the line, near the fly, in your left; when you move the rod backward to cast the line, let the latter go from your left hand. Practice several throws at this length, and increase it occasionally, as you improve, until you are able to throw almost any moderate length, with ease, to within an inch of any spot you desire. Draw the fly lightly toward the shore, and look sharply at it, so as to be able to strike instantly if a fish should rise at it; if you do not, you will most probably lose him, for he quickly discovers the nature of your bait. In raising your line for the second and subsequent throws, wave your rod round your head, instead of bringing it directly backward. You should not return the line before it has gone its full length behind you, lest you whip off your fly. In order to show your flies naturally to the fish, when you have thrown, raise your hand by degrees, with a slight quivering motion; and, as you thus draw the bait toward you, let it go down the stream, (for you must never bring your fly against it,) and before it comes too near you, prepare to cast again. If you see a fish rise at a natural fly, throw your line a little above him, so that the bait may come gently and naturally down toward him; fish every yard of water likely to afford sport, and never despair of success; for, sometimes it so happens, that, after many fruitless hours spent without a fish ever rising at your fly, you will fill your bag or basket during the last hour. The lighter your fly descends on the water, the greater chance you have of a bite; the way to throw with the requisite perfection in this respect, is only to be acquired by practice and love for the art. Use only one hook at a time, till you can throw to any given distance with certainty. You may acquire such a mastery, by dint of observation and practice, as to be able to cast your fly under banks, into holes, among bushes, &c., where the best fish are frequently found. Endeavour to keep the wind at your back, and when fishing in a



small stream, where the middle is shallow, and the water ripples, cast your bait to the opposite side, slowly draw it to the rippling, and let it float down some distance. You must recollect to keep yourself out of sight, and your fly in motion, that it may appear to the fish as if alive. If you do not find the fish rise toward the top, sink your fly, by degrees, even to middle water. Before flies are naturally in season, the fish very rarely rise at them; therefore, in order that you may not be mistaken in your baiting, observe what flies are about the water, or on the bushes or trees near the ponds or rivers; and that fly which swarms there most, being chiefly in season, is to be used.

If the wind be pretty high, the fish will rise in the plain deep; but when little wind is stirring, it is best to angle in the stream. We need scarcely remind you of the propriety of taking your basket, landing-net, book of flies, and, if you are able to construct an artificial fly yourself, a few materials for fly-making; so that, if the fish, which are often whimsical, will not take any of the baits with which you are provided, and you observe them rising at natural flies, (and they will sometimes feed on such insignificant ones as, at other times, they will scarcely look at,) catch one of such flies, and make one for your bait as nearly like it as possible. This, certainly, is a great advantage, and every Angler ought, therefore, perhaps, to acquire sufficient knowledge in fly-making to be able to produce such a tolerable imitation, that the fish may not easily detect the difference between the natural and the artificial fly.

GENERAL RULES FOR ALL ANGLERS.

In bottom-fishing, plumb the depth truly, and with as little disturbance as may be; let your line, with the plummet to it, remain in the water while you cast in the ground-bait, by which time the line will be softened and stretched; keep as far from the water as you can. Use fine tackle, and you will the sooner become skilful: if you break your tackle, do not lose your temper, but sit down, and diligently repair it. If hail fall, or the day be cold, and the wind blow strong, the Angler must not expect much sport. A soft rain, or foggy, close weather, most fish will bite. Never drink water out of rivers or ponds while in a perspiration; keep your feet dry, by wearing strong boots and shoes. It is supposed that the best winds for Angling are the south, west, and south east. In hot weather, the cooler the wind blows the better; but in the early part of the season, and also in autumn, a warm wind is more advantageous. When the wind comes from a cold quarter, such places as are most protected from its influence should be resorted to. A cloudy day, with light showers, after a bright night, in general proves most favorable to the Angler, who may also expect good sport even on these days when heavy rains descend during the intervals between the showers. When a calm bright morning is succeeded by a gloomy day with a brisk wind, without any fall of rain, the fish,—at least, the larger sorts,—are almost sure to feed. Weather-wisdom is of the greatest benefit to the

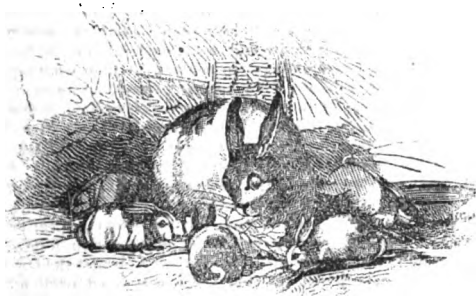


Angler :—our young friends should therefore pay attention to, and remember the state of the wind, the clouds, &c., on those days when they find the fish bite, and when they refuse to take a bait. They may thus not only be enabled to say when there is a prospect of sport, but also save themselves much trouble and disappointment, by staying at home to improve their tackle, or amusing themselves in some other manner, instead of following "the devious windings of the stream," when the weather is unpromising. When the wind blows right across the water, fish with your back toward it—not merely because you can throw your line with more facility, but because the fish will certainly be on that side, watching for the flies, &c. that may be blown from the bank into the water. Throw as near the bank on which you stand as the wind, if it be high, will suffer you. In the summer time, when the sun is out in all his splendor, and there is scarcely a breath of wind stirring, you may often see the fish basking in clear low water, with their fins and a part of their backs above the surface. On these occasions, they will rise greedily at a huckle, if your foot length be fine, and you fish at a sufficient distance to be unperceived, under banks or straight down the sides of streams. Your line, for this purpose, must be long; and if, when you hook a fish, the others should become alarmed and shoot off, retire for a short time and in all probability they will return again; if not, you must try elsewhere. Artificial Bait, and Apparatus for all kinds of Angling, may be had at Bradlee's near the Old South Church, in Boston.





RABBITS



See where a motley litter sports around
The captive doe, whose native symmetry
Has so improved 'neath man's dominion,
That her grandsire's progeny, sporting wild
O'er hill and dale, in their plain russet coats,
Seem of no kin to her.

RABBIT-KEEPING was never, perhaps, so much practised in England as it is at the present day. Not only do a multitude of young persons keep common rabbits for their amusement, and poulterers and others for the table, but of late, many gentlemen have become rabbit-breeders to a considerable extent; and though the varieties are so much less numerous, it promises to become, ere long, as popular a fancy as that in pigeons. A writer on this subject states, that there are, or were, two great feeders in the counties of Oxford and Bucks, the former of whom kept a sufficient number to produce three dozen rabbits for the market per week; the latter it is said, kept white rabbits only, on account of the superior value of their skins for the purpose of trimming. These persons, however, must be considered rabbit-keepers rather than fanciers.



very inferior in beauty of appearance to the fine lop-eared creatures. We feel convinced that any person who sees a well-ordered rabbitry, containing some good specimens of fancy rabbits, will be so struck with their superior beauty of appearance, that he will not think of keeping merely common rabbits. The first is the only extra expense; for the fine lopped-eared animals do not require more or superior food than what ought to be afforded to the common ones. They are, we confess, rather more delicate in constitution; but their fine appearance will certainly compensate their keeper for the care he may take in keeping them in order; there is also a greater pleasure in breeding valuable animals, than rabbits, that, at best, will never be worth, when reared, above half a dozen shillings. And here let us impress upon our young readers the propriety of feeding their rabbits regularly. Poor creatures! they are caged, confined, and wholly dependent upon us—it would be the extreme of barbarity to neglect them. If we keep any living creature in a confined state, we enjoy a duty on ourselves of providing for their wants. Depend upon it, that the boy will rue the day, unless he have decidedly a bad heart, who sits down to a comfortable meal, while his rabbit or his bird—heretofore his idol and his toy, but now, in caprice, neglected—pines, in its prison, for his appearance with its usual daily food. If he be tired of that, which, when it was a novelty, he took so much delight in, he had better sell, give, or even humanely kill it, than suffer it to languish its solitary hours away in hunger and in thirst. It is a creature dependent on his care,—it is helpless and imprisoned—is he not cruel in the extreme if he omit to furnish it with its daily pittance?

THE WILD RABBIT.

Wild rabbits are considerably less than those which are kept in a domestic state; they are, for the most part, of a gray color; but a few black, black and white, and even fawn-colored rabbits are to be seen in some warrens. The flesh of wild rabbits is, in general, preferred to that of tame ones; but the latter may be much improved in flavor by judicious feeding, and affording the animals good air and sufficient room to exercise themselves.

It is said that the wild rabbit will breed eleven times a year, and bring forth, generally, eight young ones each time; at this rate, in four years, a couple of rabbits would produce a progeny of almost a million and a half.

THE COMMON DOMESTIC RABBIT.

One of the chief objects in keeping common rabbits is, for the purpose of occasionally furnishing a dish for the table; and, therefore, those persons, by whom they are kept, attend as particularly to the sort of rabbits whose flesh is said to be the best, as to their colors or shape.

The short-legged stout rabbits are generally supposed to be the most



healthy, and also the best breeders. The large hare-colored variety is much esteemed by some people; but the white, or white mottled with black or yellow, are more delicate in flesh. The gray and some of the blacks approach nearer to the flavour of the wild rabbit than any others.

LOP-EARED, OR FANCY RABBITS.

Formerly, a fine rabbit of any two colors, however short its ears, was accounted a fancy animal: it is now very different. In the eye of a fancier of the present day, the long lopped ear is an indispensable requisite. The first things that are looked at are the length and fall of the ears; the dewlap, if the animal be in its prime, is next noticed; the colors and markings are then inspected; and, lastly, the shape and general appearance. Rabbits, whose ears do not extend to fourteen inches from tip to tip, measured across the skull, would be reluctantly admitted into a fancier's stock, if they fell ever so finely; or, in case they exceeded that length, (and they sometimes are sixteen inches, and even upward,) if they did not lop or fall downward, in what is deemed a graceful and becoming manner. The dewlap, which is only seen in fancy rabbits, sometime after they have attained their full growth, adds materially to the beauty of their appearance: it commences immediately under the jaw, goes down the throat, and between the fore-legs: it is so broad, that when the head reposes upon it, it projects beneath the chin, and on each side beyond the jaws; it is usually parted in the centre in front, and is equal in size to a couple of good-sized eggs: when the fur on it is of a beautiful color, it produces a very fine effect.

The annexed cut is a portrait of Wowski, a first-rate fancy lop rabbit, in the possession of the writer. At the time of making the drawing for this



cut, Wowski was just ten weeks old; her ears matching perfectly with each other, and measuring, from tip to tip, nearly thirteen inches. The difference in the buck, and general appearance, to say nothing of the ears, between the fancy and the com-

mon rabbit, cannot fail to strike the reader who will take the trouble of comparing the annexed engraving with the cut of the common domestic rabbit, inserted on page 273.

Fancy rabbits fetch high prices compared with those of the common ones, five, ten, and even as much as twenty guineas, have been given for a first-rate doe. Very good fancy rabbits may, however, be bought for less sums



than these; the foundation of a fancy stock, provided young rabbits only be bought, may be made for even much less. We know a youth who began to keep fancy rabbits but two years ago, and has now a very brilliant little stock. He purchased three rabbits, each about two months old, of excellent breed; but being all deficient, in some respect, with regard to properties, they cost him between twenty and thirty shillings only. These three rabbits, being of the true fancy strain, have occasionally thrown very excellent specimens, which he has selected and reared: the first he has disposed of again, and his hutches did not, at the time we saw them, which was about three months since, contain an animal that would not pass muster in the rabbitry of a first-rate fancier.

THE RABBITRY AND HUTCHES.

The rabbit house should be dry and well ventilated; too much humidity, whether externally or internally, will cause the rabbits to rot. Where considerable numbers are kept, fresh air is absolutely necessary to preserve them in a state of health; still they should not be exposed to draughts, which, on many occasions, have brought on a disease called the snuffles—a dangerous, and frequently fatal malady. If economy be an object, or the young fancier be desirous of employing his mechanical abilities, he may construct hutches sufficiently good for common purposes himself. A tolerably good doe's hutch may be made out of an old egg-chest, and places for bucks and weaned rabbits, of tea-chests; the former are to be bought at a cheesewinger's, the latter at a grocer's shop. If our reader should become his own carpenter in this case, we recommend him to follow, as much as his abilities will admit, the directions which are given for making hutches in the following page. Young persons should begin by keeping common rabbits, for which common hutches, such as they can construct themselves, if so inclined, will be quite good enough. When they have



RABBITS.

377

part of the hutch, and in depth from the top to within two or three inches of the bottom; it must be made of a frame of wood tinned on the inside, with stout wire or slender iron rods nailed or driven into the top and bottom parts of the frame, from three quarters to an inch apart. Hang it on a pair of small hinges to that side of the hutch which is opposite the partition, and fasten it by a latch or buckle. Under this door, a drawer for food, well tinned round the edges, is to run in; it should be fastened by a buckle fixed to the lower part of the large door, or it may be so contrived that the door will keep it close without any fastening. Nail tin round the hole in the partition, (which ought to be circular,) and, in fact, to every other part of the interior of the hutch which the rabbits can take hold of with their teeth; as they are very destructive animals, and would actually gnaw themselves out of a mere wooden hutch. The bottom must be planed quite smooth, and a slip be taken off the lower part of the back of the hutch to let the urine run off: for this purpose, hutches should also be set a little on the slant backward.

The buck's hutch is made different in every respect from the breeding hutch; instead of being square, it is almost semicircular; the back and sides being gradually rounded off from the front. The wires are placed wider apart, and are thicker and stronger than those used for doe's hutches: it has no partition, and the drawer, instead of running the whole breadth of the cage, as there is never more than one rabbit at a time to feed out of it, is placed in the centre, to a cross piece which goes from side to side, as the front piece of the drawer in other hutches. There must be an aperture at the back close to the floor, for the purpose we have before mentioned, and the door, which, excepting the drawer, constitutes the entire front of the cage, should be well hinged and fastened with a stout button. The buck's hutch should not be less than twenty inches high, two feet and a half broad, and twenty inches at its deepest part.

The hutches may be stacked one above another, or set in a row, as choice or convenience may direct. They should, however, never be placed upon the ground, but elevated on wooden stools, or horses, a foot or two above it; neither ought the back parts of them to be put close against the wall, but sufficient room should be left for the dung to have a passage from the apertures made in the lower part of the back to the floor.



we give a little hay, or dry clover, and a few of such vegetables as are in season; in the afternoon, we put two handfuls of good corn into her trough; and, at night, we give her a boiled potato or two, more vegetables, and if her hutch be clear of what we gave her in the morning, but by no means otherwise, a little more hay or clover. If you give rabbits more hay than they can eat in a few hours, except it be to a doe just about to litter, they will tread it under foot, and waste it; if you give them but a moderate quantity at a time, they will eat and enjoy it. Generally speaking, rabbits prefer green or moist food to corn: but it is necessary to make them eat a sufficient proportion of solid food to keep them in health; occasionally, instead of corn, we give our rabbits a few split or whole gray peas. When a doe has a litter by her side, and also for rabbits recently weaned, we soak the peas for a few hours previously to putting them in the trough. If a rabbit will not eat a proper quantity of corn, we mix a small quantity of squeezed tea-leaves with her portion, and stint her proportionately in green meat, Barley-meal, dry as well as scalded, we occasionally use, to fatten for the table, or to bring a poor rabbit into good condition; and in winter, when greens are scarce, but not otherwise, we feed with fresh grains mixed with oats, peas, meal, or pollard. Tea-leaves, in small quantities, well squeezed, may at all times be given, by way of a treat; but it is highly improper to make them a daily substitute for green meat.

Almost all the vegetables and roots used for the table may be given to rabbits; in preference to all others, we choose celery, parsley and the roots and tops of carrots; and in this choice the animals themselves heartily agree with us; lettuce, the leaves, and, what are much better, the stamps of cabbages and cauliflowers, they eat with avidity, but they must be given to them with a sparing hand; turnips, parsneps and even potatoes in a raw state we occasionally afford our stock, on an emergency, when better roots or good greens are scarce. In the spring time no soft meat is better for them than tares, so that they be not wet: in fact, no green ought to be given to rabbits when there is much moisture on its surface. We have heard of some country persons feeding their rabbits on marshmallows, but we never did so ourselves. Dandelions, milk thistles, we know, by long experience, they take in preference to all other food, except celery, parsley, and carrots; and nothing, we are convinced, as green meat, can be better for them.

It must be remembered that a doe will not suck twice as much when



will increase rather than appease its thirst; for this reason, in such a case as we have mentioned, we moisten the grain; and some rabbits will even do well with an occasional table-spoonful of water, beer, or milk; but it is a dangerous experiment to try the effect of a liquid on their stomachs.

BREEDING.

The doe will breed at the age of six months; her period of gestation thirty days. The rabbits are not to be left together above ten minutes. Some days before kindling, hay is to be given to the doe, with which, and the flax which nature has instructed her to tear from her body, she will make her nest. Biting the hay into short pieces, and carrying it about in her mouth, are almost certain signs of her being with young. The number produced varies from three to eleven. Destroy the weak and sickly ones, as soon as their defects can be perceived, until the litter is reduced to five or six. If you leave more to be suckled, some will, perhaps, die, others be sickly, and none of them fine. The old rabbits are not to be put together till the expiration of six weeks: the young may be separated from the doe and weaned a fortnight after. If more than five or six litters are obtained in a year, the doe will be soon worn out, and the young ones not worth much. The doe should not be disturbed by any other rabbit, while with young. Should she be weak after kindling, give her a malt mash, scalded fine pollard, or barley-meal, in which may be mixed a small quantity of cordial horse-ball. In this case, and, in fact, whenever a doe is weak, bread-soaked in milk, and squeezed rather dry again, if she will take it, will considerably strengthen her.

If well fed, and kept warm, does will breed all the year; but most fanciers are contented with five litters a year, and let them rest during the winter. Mowbray states, that the produce of rabbits is so multitudinous, that one might be well satisfied with this practice; for that even four litters in the year would be equal to two thousand young rabbits annually, from a stock of one hundred does. If does devour their young, or do not breed for any considerable time, rabbit fanciers dispose of them as useless incumbrances to their stock. It is advisable so to manage, that two or three does should kindle about the same time: you may then take from the doe that has the great-



DISEASES.

Diseases may, in a great measure, be prevented, by regularity in feeding, good food, and cleanliness. The refuse of vegetables should always be scrupulously rejected. For the liver complaint, to which rabbits are subject, there is no cure : when they are attacked by it, fatten them, if possible, for the table.

The snuffles are occasioned by damp or cold. If there be any cure for this disorder, it must be dryness in their hutches and food.

Squeezed tea-leaves generally restore a doe to health, if weak, or otherwise affected after kindling, if the food which we have directed to be given at that time, under the head of Breeding, should fail. When old rabbits are attacked by a looseness, dry food will, in general, restore them ; but do what you will, it is very difficult, and, in most cases, impossible, to save young ones from sinking under it ; dry food for them as well as for the old ones, is the only remedy.

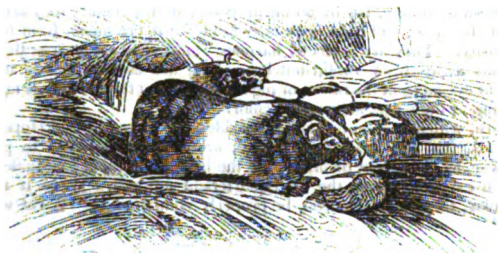
GENERAL OBSERVATIONS.

Be careful to keep your rabbit-hutches particularly clean ; a sheet hoe, or a trowel, and a hand-brush, will be necessary for this purpose. Do not handle your rabbits, particularly the young ones, too much ; when you lift them, take them with one hand by the ears, and place the other under the lower part of their backs. Never slacken in attention ; a neglect of a day will do your stock much injury ; while by constant care you may breed to great perfection. Those who are fanciful in colors should not only look at those of the rabbits they buy for breeding, but also ascertain, if possible, the colors of the does they come from ; for rabbits frequently throw litters, in which not a single young one of their own color can be found. If there happen, for instance, to have been a single cross of gray in your stock for three or four generations back, it will frequently appear in stock, although every breeding rabbit in your hutches be of a different color. Gray is the most difficult of all colors to eradicate ; but even gray rabbits do not always have young ones of their own color.

The more you vary the food, the fatter your rabbits will be ; but observe, that when they are once *fall fat*, (to use a term of breeders,) they frequently fall off and pine away to bad condition. It is impossible to lay down rules for the precise quantity of each sort of food to be allowed ; a little experience alone can teach the youthful fancier this secret.



GUINEA PIGS.



"A rat without a tail."

MACBETH

THESE little animals were originally natives of Brazil, but they have long been introduced to this and other European countries. They propagate in temperate, and even cold climates; and would be exceedingly numerous, had they not, like most other animals whose produce is abundant, a great number of enemies. The males frequently devour their own offspring, which also suffer much from cats, &c. It is said, however, that rats will carefully avoid them; and under this idea, they are frequently bred by rabbit-fanciers, for a protection to their young stock against those destructive vermin. In a rabbit-house they are by no means troublesome, as they may be suffered



half divided ; they have two cutting teeth in each jaw, and their ears are broad and erect. They are of varied colors, white, black, and fawn ; the tortoise-shell, (i. e.) a mixture of the three colors, is generally preferred. Some of the white ones have red eyes, similar to ferrets and white rabbits. Their flesh is eatable, but by no means good ; in this country they are never used for the table, and have been tasted only, it is presumed, from motives of curiosity. They are perfectly harmless, and, unless it be true that they keep rats away from rabbit-hutches, altogether useless. They may be bought at the shops of the rabbit or pigeon dealers, at from sixpence upward, according to their age, shape, and color.

Nature, which has so abundantly provided the Cape of Good Hope sheep with tails, that the farmers, it is said, are frequently obliged to provide small wagons to support them, has left the little Guinea pig totally destitute of this usual ornament to the hind quarters of animals. Were it not for their color, they might, indeed, be properly compared to "A rat without a tail."





PIGEON



**Aloft in air the rapid pigeon soars,
The messenger, by turns, of joy and we,
But heedless ever of her high envoy,
Even while cleaving yonder distant cloud,
Her heart is fixed on home, and her loved young;
Thus does brute instinct in man's hand become
A mighty engine.**

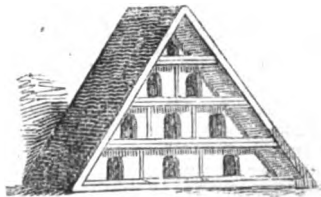


The young ones are usually of different sexes. For the first three days after they are hatched, the female seldom leaves them; after that time, the cock and hen attend to feed them indiscriminately. The way in which the old supply the young with food is singular: the parent birds collect a quantity of grain and water in their crops, which are very capacious, and when it has lain there until soft and macerated, they cast it up into the throats of the young ones. As the young birds acquire strength, the old ones give the food less preparation, and at last drive them out to provide in part for themselves; but they are often seen feeding their young ones even when the latter are able to fly, and they themselves are going to nest again. The young ones, while fed by the cock and hen, are called *squeakers*, under six months old *squeakers*, and after that age they are denominated *pigeons*, being in a fit state to mate and breed.

THE DOVE-COTE, OR PIGEON-HOUSE.

As many young people will take a pleasure in breeding a little flock of birds from a common box, fitted up against a wall or elsewhere, we shall give

them a few words of advice on the subject. The form of the box is immaterial; the triangular is, perhaps, the best, because it allows the wet to run off quickest; it may be made with any number of holes, which should be sufficiently large for the pigeons to turn round in them with ease. Shelves and partitions of six or eight inches deep should run along



the front, to keep the couples apart, and afford them good resting-places. It will be an advantage, if you can allow two holes between each partition for each couple of birds. The box may also be made square; or in fact, according to the convenience or fancy of the individual fitting it up. It should be fixed where it will be secure from rats and cats, and ought always to face a warm quarter; cold winds being very pernicious to the birds.



Many persons convert the spaces between the garrets and the roofs of their houses into lofts, by making an aperture in the tiling, which opens on a platform, fixed on the outside. It is necessary in this, as in all other cases to erect proper fences to keep out the cats. If possible, for the sake of warmth, your loft should face the south or southwest; but as it rarely happens that convenience will allow of a room being occupied entirely by pigeons, it is seldom that the birds are indulged with this advantage. Any place, in fact, that is dry, light, airy, and sufficiently commodious, may be converted into a good loft.

The shelves for the breeding place should be fourteen inches, or a little more, in breadth; and if you breed Pouters, there ought to be twenty inches between the upper and lower shelves, or otherwise the pigeons will acquire a trick of stooping, which will spoil their deportment. Partitions should be made in these shelves, about three feet apart, and a slip of board run along the front of the lower shelves about four inches high, to keep in the nests. This slip should run in a groove, or be otherwise managed so that it may be easily removed, in order to clean out the nests when expedient. A similar slip must also be fixed in the middle of each three feet division, which is thus adapted for a double nest, in one of which, the old hen may lay in quietness without being disturbed by her young ones in the other, as she often leaves them when about three weeks old to the care of the cock, and goes to nest again. Some Fanciers darken the nest by setting up a board a few inches within the edge of the shelves, having an entrance hole cut through it; thus dividing the partition into an outer shelf or landing place, and an inner room or nest: in this case, of course, the slip is unnecessary. A good contrivance to keep the birds private when setting is, perhaps, worth attention, as they are sometimes shy, and get uneasy, or even fly off their eggs, in alarm, on any person's entering the loft. Some tame pigeons will not make their nests; to such it will be right to afford a little hay. Straw buckets and pans of earthen-ware are used by many Fanciers for nests. When the latter are adopted, it is usual to place a brick between them (there being two pans in every partition) for the convenience of the



handle your squabs or young birds too much, lest you bring an illness on them which may prove fatal.

The common pigeon will, during a great part of the year, seek the principal part of its own food, and live upon almost any grain; the fancy birds require delicate food and much attention. Of all grain, old tares prove to be the best suited to the nature of these birds; new tares should be given very sparingly, especially to young pigeons, as they are very liable to do them much injury. Horae beans are esteemed the next best food to tares, the smallest of these are preferred, especially small ticks. Wheat, barley, oats, and peas, ought only to be given now and then for a change of diet as they sometimes hurt them. Rape, canary, and hemp-seed, pigeons are immoderately fond of; but these must not by any means be made a constant diet.

Mating or coupling of pigeons is often attended with much difficulty. In order to effect it, let two coops be built close together with a partition of lath between them, so that the birds may see each other, and they should feed out of the same vessels; by supplying them well with hemp-seed, you may soon make them fit for mating, and when you perceive the hen to sweep her tail, you may remove her to the cock's pen, and they will soon agree. When this convenience is wanting, and you are compelled to put them both into the coop at first, put the cock in three or four days before the hen, that he may get master of the coop, particularly if the hen be a termagant, or else they will quarrel so much, that their bickerings will end in an irreconcilable hatred. When the pigeons are matched, you can give them the run of the loft to choose a nest for themselves, or fix them to one, by inclosing them within it, by a lath railing, giving them food and water in plenty for eight or nine days.

DISEASES AND REMEDIES.

For the wet roup, give them three or four pepper-corns once in three or four days, and steep a handful of green rue in their water, which you may let all the pigeons drink of. The dry roup is known by a dry husky cough; it proceeds from a cold; to cure it, give them three or four cloves of garlic every day.

The canker arises from the cocks pecking each other: for this, rub the affected part every day with burnt alum and honey. When the steam rumsed



PIGEONS.

287

Set downward, smoothing up the crop, that the over-loaded bag of meal may not hang down; then hitch up the stocking on a nail, and keep it in this posture, supplying it with a little water now and then, till the food is digested. When taken out of the stocking, put the bird in an open coop or basket, and feed it but very moderately for some time.

The *megritis* is a disease in which the pigeon flutters about at random, with its head reverted in such a manner that its beak rests upon its back. This malady is pronounced incurable.

When pigeons do not moult freely, put them into some warm place, and mix a good quantity of hemp-seed in their common food, and a little saffron in their water.

If they be lame, or the palls of their feet become swelled, either from cold, being out with glass, or any other accident, spread some Venice turpentine on a piece of brown paper, and put it to the part affected.







FENCING.

Wouldst have thy son acquire a graceful port,
A manly bearing ;—make his eye acute
As that of the hawk, and his young limbs vie
With those of roe-bucks in agility ?—
The noble art of Fencing let him learn.

In those days, when a small sword was an indispensable ornament to the person of a gentleman, objections were sometimes raised to the cultivation of the art of Fencing, as tending to lead young persons into broils and duels ; but nothing can now be said against it on this score ; the wearing of swords, except among military men, has long ceased, and duels being invariably decided in this country by pistols. The art of Fencing is acquired, therefore, as the means of affording excellent exercise, elegant amusement, and imparting an easy deportment and graceful action, as well as extraordinary acuteness of eye, and agility of body. That it has these merits, there can be no doubt ; and it is, therefore, confidently recommended to youth, as being not only perfectly unexceptionable, but even superior, in most respects, to all other exercises.

FOILS, MASKS, &c.

The foils should be proportioned to the size of those who use them. Thirty-one inches is the medium for men ; it is advisable to use a glove on the right hand, padded on the back and the outsides of the fingers ; the masks must have wire fronts, stout enough to resist an accidental thrust at the face. An easy dress should be worn, and it is usual, in academies, to have a spot, or heart, on the left side of the breast of the waistcoat.

HOW TO HOLD THE FOIL.

The hilt must be flat in your hand ; so that the two edges are nearly horizontal when you throw yourself upon guard ; your thumb should be stretched along the upper flat part of the hilt, within half an inch of the shell, and the pommel should rest under your wrist.



COMMON GUARDS OF CARTE AND TIERCE.

Stand in the first position, which is similar to the first position in dancing—that is, your right foot forward, with the heel advanced; then throw yourself upon the common guard or carte, by advancing your right foot about half a yard from the left. The two heels should be in the same line. Turn your wrist so that the nails may appear upward. Let your hand be on a line with the lower part of your breast; the arm not stretched, but a little bent, and the elbow inclined a little to the outside. The point of your



foil should be about fifteen degrees elevated, and nearly fixed on a line with the upper part of your adversary's breast. The left arm (which is necessary to balance the body in its different movements) must be raised in a semi-circular manner, on a line with the forehead, the hand kept open in an easy manner, the thumb and first finger nearly meeting. Your body should be sideways, and your head turned toward the right, so as to keep sight of your point. Let the

balance of your body rest upon the left leg, keep the left knee bent, and flexible, so that you may incline a little backward; the right knee should also be rather bent, and perpendicular to the point where your right heel rests.

The position of the guard in tierce is similar to that of carte, only the hand must be a little reversed, so that the nails may be half turned downward. The arm should be a little stretched outward, in order to secure or cover the outside, and the point should be as in carte.

ENGAGING AND DISENGAGING.

Engaging in carte, or in tierce, is opposing your adversary's blade, either inside or outside, when you first join or cross blades on guard. Disengaging is performed by dexterously shifting the point of your foil from one side of your adversary's blade to the other; that is, from carte to tierce, or *vice versa*.

THE ADVANCE AND RETREAT.

In order to advance, move the right foot easily forward to the distance of more than a foot, and let the left foot instantly follow to the same distance; these two movements must be performed in the same instant. Keep your body firm and steady while you repeat this five or six times; and let there be a short pause between every advance. After making five or six ad-



vances, observe if the distance and position of your guard be exactly the same as your distance and position were when you commenced. In the retreat, your left foot makes the first movement backward, and your right follows at the same moment.

THE SIMPLE PARADES OF CARTE AND TIERCE.

These are distinguished from all the others, on account of their securing the breast, as upper parades. To perform that of *carte*, place yourself on the common guard, and throw your hand toward the left, or inward, about six inches from guard, making a gradual turn upward with the wrist, in order to throw off your adversary's blade with the greater ease; at the same time draw your hand a little toward your body, that the opposition may be more powerful.

The simple parade of *tierce* is also performed from the common guard by throwing and stretching your arm obliquely downward to the right, (or outwardly,) the nails being reversed by the gradual turn of the wrist, in forming the parade. It carries the simple thrust of *carte* over the arm and seconde. The distance of the hand from the common guard should be six inches. The point of your foil, your body and legs, should not deviate from the line of direction in performing either of these parades.

THE PARADES OF OCTAVE AND SEMI-CIRCLE.

To perform the octave parade, raise the hand as high as your chin, the nails must not be turned up so much as in *semi-circle*; your arm should be well stretched and thrown outward, the distance of six inches; the wrist should be bent as much as possible, in order that the point may fall on a line with your adversary's flank, making nearly the same angle from guard-point as *semi-circle*.



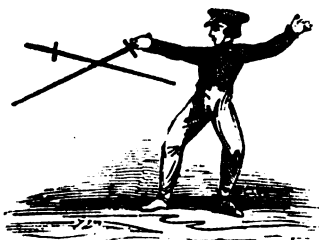
Semi-circle parade is useful against thrusts of low *carte*, *seconde*, and the disengage and thrust of *carte* over the arm. Let your body be steadily inclined upon the left side; drop your point, with the nails upward, so as to form an angle of nearly forty-five degrees with the guard-point. At the same time, stretch your arm well out, raise the hand as high as your

mouth, and throw your arm inward, the distance of six inches, from the line of direction in your common guard, that your point may appear to the eyes as looking to your arm. (*Vide cut.*)



THE SIMPLE PARADES OF SECONDE AND PRIME.

These two parades are not used so frequently as the preceding four. *Seconde* is very powerful against the simple thrusts of low *carte* and



seconde. To perform it from *carte* to *tierce*, the nails and wrist should be turned downward, the point be dropped, and the hand opposed outward, as in the parade of *octave*. The point's tract from guard is also nearly the same with the parade in *octave*, and the inclination of the blade should form the angle of forty-five degrees. (*Vide cut*)

Prime is performed with the nails turned downward, the hand raised higher than the mouth, and opposed inward, in

the same manner as *semi-ci.cle*. The arm should be drawn well in toward the body, and the wrist bent downward, that the point may fall more than in other low parade.

THE EXTENSION, LONGE, THRUSTS OF CARTE, CARTE OVER THE ARM, AND TIERCE.

Thrusts are, for the most part, executed with the *longe*, except thrusts of the wrist, and thrusts of the extension. They may be performed either



after disengaging the point or not. To perform the straight thrust of *carte* inside, your point must be directed to your adversary's breast, the arm well raised, and opposed inside, the nails upward, your body projecting forward, and an extension performed of the right arm and left leg. (*Vide cut*, which represents the position of extension.)

Then push home the thrust in *carte* by *longeing* out to a distance proportionate with your height. You



his arm should be stretched down by the flank, at the distance of two or three inches, and always raised as you recover upon guard, by way of grace



and balance to your movements. Your body should incline a little forward; the head be raised upright, looking outward over the shoulders, so as to have a full view of the point. As you approach your adversary's breast, make a gradual resistance against his foil inward, by way of cover to your longe. Keep the right knee bent, and in a perpendicular posture with your heel; the left knee

and ham stretched, with the foot firmly fixed to the ground.

To recover yourself with the requisite ease, lean with some degree of force on the heels of both feet; the greatest force is first upon the right, then it falls on the left; by bending the left knee at the same time, and inclining the body backward, you come to guard. The thrust of *carte over the arm* is performed in the same manner as *carte inside*, by disengaging to tierce, with this difference, that the head is raised upright on the inside, and the hand well opposed outward, in order to be well covered. The thrust of tierce differs only from *carte over the arm*, by reversing the wrist, the hand being well raised and opposed outward.

LOW CARTE, OCTAVE, SECONDE, AND PRIME THRUSTS.

Low *carte*, sometimes called semi-circle thrust, is delivered after coming the parade of semi-circle, in the same manner as simple *carte thrust*; only the hand and point must be fixed lower. It is an excellent thrust, if your adversary have frequent recourse to his high parades.

Octave thrust is delivered after the parade of octave, on the flank or belly; the arm being well opposed outward. If you parry your adversary's thrust by octave, your return will naturally be the thrust of octave, which may, at the same time, touch him with the extension only, without the longe.

The thrust in *seconde* is delivered after the parade of the tierce, or when engaged by tierce, by dropping your point under your adversary's wrist with the sails downward; longe and deliver the thrust on the flank.

Prime is the natural thrust in return, after having parried your adversary's



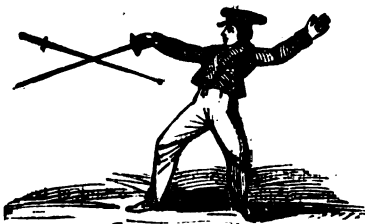
force, when advanced considerably within his measure, and pressing vigorously upon you. It is only an extension of the arm from the opposition of the parade to your adversary's body, the nails being kept downward. The arms should be well raised, and opposed inward.

VARIATIONS AND LESSON ON ENGAGING AND DISENGAGING, ADVANCING AND RETREATING, SIMPLE PARADES, AND THRUSTS OF CARTE AND TIERCE.

Suppose you are engaged in carte with an adversary; he retreats; you advance, well covered in carte; he retreats again; you advance with a disengagement to tierce, and so forth, alternately, taking care that you are properly covered on each engagement; his retreat and your advance should be comprehended in the same moment of time; in the same manner, you may retreat while he advances. On the engagement of carte, your adversary delivers a thrust in carte; oppose it by forming your parade in carte, then return the straight thrust thereof. He again thrusts straight in the same manner; also throw it off by forming your parade in carte; deliver in return the thrust of carte over the arm, by disengaging to tierce. On the engagement in tierce, he disengages, and thrusts carte inside; throw it off by your parade in carte, disengage, and thrust carte over the arm; he parries, and returns in tierce, which you parry by a parade in tierce, and lunge home with a straight thrust in tierce.

LESSONS AND VARIATIONS IN SEMICIRCLE, LOW CARTE, AND OCTAVE.

On the engagement of carte, drop your point and deliver the thrust of low carte. On the same engagement, your



adversary thrusts straight home; throw it off by parade in carte, then deliver a return of the thrust in low carte. On the same engagement, disengage to tierce, and thrust carte over the arm; he opposes it with his parade, and returns a disengaged thrust in carte; which throw off with the parade of carte; then, with vivacity, drop your point, and deliver a thrust in low carte. On

the engagement of tierce, your adversary, by disengaging, attempts to deliver a thrust in low carte; throw it off by performing the parade of octave (*Vide cut*;) then make a quick return of the thrust in octave.

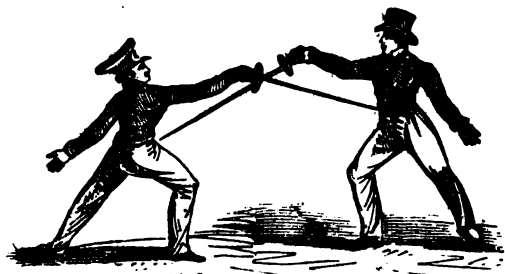
On the engagement of carte, he thrusts low carte, parry it by octave;



FENCING.

230

Instantly form your extension, fix your point well to his body, and you may almost make sure of touching him. (*Vide cut.*)



On the engagement of *carte*, he disengages to *tierce*, and thrusts; throw it off by your parade of *tierce*; then reverse your nails upward, and return a thrust in *octave*.

On the same engagement, he thrusts low *carte*, oppose it by forming your parade in *semi-circle*; then deliver a thrust in *octave*, by disengaging over his arm, commonly called a counter disengagement.

LESSON AND VARIATIONS IN PRIME AND SECONDE.

On the engagement of *tierce*, your adversary advances within his measure, and delivers a thrust in *tierce* or *carte* over the arm; oppose his blade by the parade of *prime*, and return a thrust in *prime*. (*Vide cut.*)



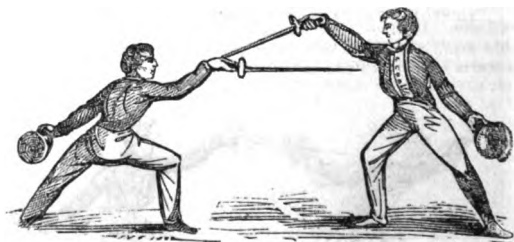


On the same engagement, he advances, disengages, and forcibly thrusts *carte*; drop your point, and parry it with *prime*; then disengage over his arm, and return a thrust in *seconde*.

On the engagement of *carte*, he disengages, and thrusts *carte* over the arm; parry it with simple tierce, and return a thrust in tierce; he advances, as you recover, within his measure, forcing upon your blade; form your parade in *prime*, and deliver a quick return of the thrust thereof. On the same engagement, he again disengages, and thrusts *carte* over the arm, which parry with tierce, and return the thrust thereof; he forces a thrust without advancing, parry it with *prime*, then disengage over the arm, and return your thrust in *seconde*.

THE SALUTE.

Place yourself on guard, engage your adversary's blade on the outside; by way of compliment, desire him to thrust first at you; then drop your point, by reversing the nails downward, with a circular motion; draw your right foot close behind the left, stretching both hams; raise your right arm, and, with your left hand, take off your hat gracefully; then make a circular motion with your wrist, with the nails upward, while you advance your right foot forward, forming your proper extension. Your adversary makes the same motions, keeping equal time with you; but, instead of forming the extension, he makes a full lunge, as if going to thrust *carte* inside, in order to take his measure, presenting his point at a little distance from your body while you remain uncovered on the extension. (*Vide cut.*)



When your adversary recovers his position, after having taken his measure, you also recover by drawing the right foot or heel close to the heel of the left; the right hand well stretched and raised, the nails upward, and the point dropped; the left hand raised in a semi-circular form, as if on guard; your hat held therein with ease and gracefulness; the head upright.



and the hams stretched. In this attitude, salute first in *carte*, by forming that parade; then, salute in *tierce*, by forming the parade of *tierce*; lastly, make a circular motion with the wrist, by dropping your point in *tierce*, at that moment putting on your hat, and throwing yourself upon the guard of *carte*.

When it is your turn to push, the salute only differs in one particular from the above; that is, instead of forming the extension, and uncovering the body, you make a full lunge from the first position of the right foot behind the left in *carte*; then, recover to the second position, by placing the right foot or heel close to the heel of the left; and conclude with the other movements. All these motions should be performed with ease, grace, and without precipitation. After performing the salute, and being engaged in *carte*, your adversary, agreeably to the compliment offered, pushes at your breast by disengaging nimbly to *tierce*, and thrusting *carte* over the arm. Observe, that the wrist is never reversed when he disengages; oppose it by performing the parade of *tierce*, then drop the point, by way of accustoming yourself to make the return in *seconde*, which may be termed the grace on the parade of *tierce*. Remain on this grace till your adversary recovers to guard; then join his blade in *tierce*; he disengages, by thrusting *carte* inside; throw it off by forming the parade of *carte*.

The grace or ornament to be used after forming this parade, while your adversary is upon the lunge, is by allowing the foil to remain flexible in your hand, with the point downward, keeping your hand in the same direction as if covered upon the parade.

Your adversary, after pushing *tierce* and *carte* alternately, commences the salute; and while he is on the extension, you take the measure by lunging in *carte*. Having joined blades in *carte*, disengage, and thrust *carte* over the arm. Again, he joins your blade in *tierce*, disengage nimbly, and thrust *carte* inside. (*Vide cut.*)





He opposes in carte; then let the blade and point fly loosely over the hand saving hold of your foil between the thumb and two first fingers, by which you will have a view of your adversary through the angle made thereby. This is the grace upon the longe of carte inside.

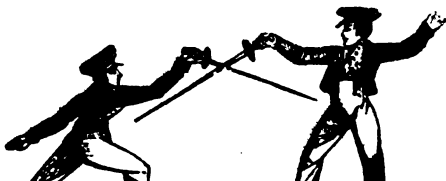
THE COUNTER, OR ROUND PARADES, IN CARTE AND TIERCE.

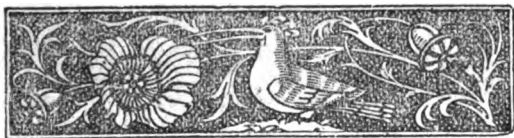
The counter-parade in carte, is esteemed one of the most essential, as it baffles a variety of thrusts, throws off the disengagements over the arm, &c. In order to perform it when your adversary disengages, follow his blade closely, with a small circle, entirely from the motion of the wrist, by which you join his blade always in carte. If he make a thrust with the disengagement, oppose it, by gradually covering yourself with the parade of carte, after having followed his blade round.

The counter, or round parade in tierce, is performed in a similar manner to the counter-parade of carte, only that the course of the point is reversed. For example; your adversary disengages to carte, with a view to thrust carte inside; follow his blade closely, with a small circle, made by the motion of the wrist reversed in tierce, stretching your arm, and giving his blade a smart and abrupt throw-off, as you overtake or meet it in tierce. The course of the point in forming the counter in carte is inward, from left to right; and in the counter-parade of tierce, the contrary.

COUNTER DISENGAGEMENTS IN OCTAVE AND SEMI-CIRCLE.

The counter-disengagement in octave may be performed after your adversary has thrust in seconde, and you have parried by semi-circle; as he recovers, counter-disengage, and thrust in octave. (*Vide cut.*)





To give a further exemplification of the counter-disengagement in octave : it is also performed by first making a feint, as if you intended to thrust octave ; he naturally opposes it, by forming his parade in octave ; then nimbly disengage over his arm to carte inside, and deliver either that thrust, or the thrust of low carte.

The counter-disengagement in semi-circle is performed on the engagement of carte, when your adversary accustoms himself to take the parade of semi-circle, by first making a feint, as if you meant to thrust low carte, which he attempts to parry with semi-circle, then nimbly disengaging over his arm, and delivering your thrust in octave.

THE COUNTER-DISENGAGEMENTS IN PRIME AND SECONDE.

The counter-disengagement in prime is seldom used in attacks ; but being so nearly related to prime parade and thrust, we shall here describe it. It is performed from the engagement of tierce, by forcing on your adversary's blade, if he betake himself to the parade of prime, then nimbly disengaging over his arm, and delivering your thrust in seconde.

The counter-disengagement of seconde may be more frequently used ; it is performed from the engagement of carte, by dropping your point, or making a feint, as if you intended to thrust prime ; your adversary opposes it, by performing the parade of seconde ; then disengage over his arm, and deliver your thrust by longeing in prime.

LESSONS AND VARIATIONS ON THE COUNTER-PARADES IN CARTE AND TIERCE, AND THE COUNTER DISENGAGEMENTS IN OCTAVE, &c.

On the engagement of carte, disengage and thrust carte over the arm ; your adversary opposes it, by forming the counter-parade of carte. Upon recovering, he, in return, disengages and thrusts carte over the arm ; oppose it by counter-parade in carte, &c. ; disengaging and parrying alternately, always making complete longes with the thrusts, and moving well to guard,



gages, and thrusts low carte, which you may baffle by first forming the parade of octave, then forming the parade of semi-circle quickly after the other; and, as he recovers, counter-disengage, and thrust octave.

On the engagement of tierce, advance within measure, forcing upon your adversary's blade; he betakes himself to the simple parade of prime; counter-disengage, and thrust seconde. On the same engagement, he advances, forces, and counter disengages as above; but baffle his thrust in seconde, by the counter-parade in prime, and return the thrust thereof. On the same engagement, he counter-disengages; follow his blade by the counter-parade in prime; if he attempt to double or disengage again, stop him, by forming your simple parade of seconde.

On the engagement of carte, counter-disengage, when your adversary drops in seconde, and thrusts prime. On the same engagement, he counter-disengages, when you drop to seconde; oppose it, by your parade of seconde; then return a straight thrust in seconde. Or if, on the same engagement, he make a straight thrust in seconde, you may parry it with semi-circle, and return low carte thrust. On the same engagement, he counter disengages, answer his movements by forming the simple parades of seconde and prime; then counter-disengage as he recovers, and deliver a thrust in seconde.

FEINTS.

Feints are used to oblige your adversary to give you openings. The simple feint, *une, deux*, (or one, two,) is performed by two separate disengagements, either on the engagement of carte or tierce, when your adversary throws his simple parades. If engaged in carte, disengage closely to tierce, then quickly disengage back to carte, and deliver the thrust thereof. On the engagement of tierce, disengage first to carte, then disengage back to tierce, delivering the thrust of carte over the arm.

Feint seconde, carte over the arm, is performed when engaged in tierce, by dropping your point, and reversing the nails, as if you meant to thrust seconde; then quickly turn them upward, and deliver the thrust of carte over the arm. On the same engagement, you may mark feint seconde, and thrust carte inside, if there be an opening.

Feints *une, deux, trois*, (or one, two, three,) are performed by three separate disengagements, either from the engagement of carte or tierce. On the engagement of carte, mark feint, *une, deux*, as above; if your adversary form his simple parade of carte, nimbly mark your third disengagement, by thrusting carte over the arm. On the engagement of tierce, disengage *une* time, and deliver your thrust in carte inside.

CUT OVER THE POINT.

This is performed when you perceive your adversary hold his hand low and his point is raised upon guard. To perform it from carte to tierce



FENCING.

30.

raise your point quickly, with the upward motion of your wrist, fairly over your adversary's point, without moving your arm from the line of direction at the same time forming your extension, and deliver your thrust of carte over the arm.

In the same manner you may execute cuts over the point, from the engagement of tierce, when your adversary holds his point high.

THRUST OF THE WRIST.

This is performed when you perceive your adversary slow in making a return, after you have lunged with a thrust; as on the engagement of carte, suppose you thrust carte over the arm, which your adversary naturally parries with simple tierce, lean with some degree of force upon his blade, and, as you recover to guard, deliver him a thrust with the wrist in seconde.

RETURN ON THE EXTENSION.

This is performed after your adversary makes a full lunge with a thrust, which you may parry so powerfully, as to throw his arm out of the line of direction; then, with all possible quickness, extend your arm, and deliver him a straight thrust in return, before he has time to recover. If the extension of the arm be not within reach, from your complete extension of the leg and arm.

APPELS, BEATS ON THE BLADE, AND GLIZADES.

Appels, beats, and glizades, tend to plant you firm upon your guard, to embarrass your adversary, and cause him to give you openings; they may be performed previously to simple thrust, feints, or counter-disengagements, &c. An appel, or beat with the foot is performed either on the engagement of carte or tierce, by suddenly raising and letting fall the right foot, with a beat on the same spot; taking care to balance the body, and keep a good position on guard.

The beat on the blade, is abruptly touching your adversary's blade, so as to startle him, and get openings to thrust. If he resist the beat, instantaneously disengage, and thrust home. If he see a simple parade, make feint one, two; or, if he use a counter-parade, counter-disengage, or double.

Glizades are slightly gliding your blade along your adversary's, at the same time forming the extension, of the arm, or the complete extension,



opposition to your adversary's blade ; you can be in no danger of exposing yourself to an interchanged thrust, that is, a thrust at the same moment.

LESSONS AND VARIATIONS TO FEINTS, APPELS, &c.

On the engagement of carte, mark feint one, two, and thrust carte inside. On the engagement of tierce, feint one, two, and thrust carte over the arm. On the engagement of carte, mark a feint over the arm, and thrust low carte. On the same engagement, mark feint over the arm, reverse the wrist, and thrust seconde.

On the engagement of tierce, mark feint seconde, reverse the wrist, and thrust carte over the arm. On the same engagement, mark feint seconde, and thrust carte inside. On the engagement of carte, in attempting the feints one, two, if he baffle it by his counter-parade in carte, counter-disengage, and deliver the thrust of carte over the arm.

On the engagement of carte, suppose your adversary hold his guard low, and his point high, make a cut over the point, forming your extension, and thrust carte over the arm. On the engagement of carte, cut over the point ; if he use a simple parade, disengage, and thrust carte inside. On the engagement of tierce, if your adversary hold his hand low, and point high, make a cut over the point, and thrust carte inside. On the same engagement, cut over the point twice, and deliver the thrust of carte over the arm. On the same engagement, cut over the point twice, then disengage, and thrust carte inside. On the same engagement, cut over the point, then mark feints one, two, and thrust carte inside.

On the engagement of carte, disengage to tierce, and thrust carte over the arm ; if your adversary form his simple parade in tierce, and be slow in making a return, deliver him a thrust with the wrist in seconde, as you recover. On the engagement of tierce, disengage and thrust carte inside, or low carte ; if he parry it with octave, disengage over his arm as you recover and deliver him a thrust in low carte. On the engagement of carte, disengage and thrust seconde ; if he parry it with seconde, counter disengage as you recover, and thrust prime. On the engagement of tierce, force upon his blade, disengage and thrust low carte : he parries it with prime, and if slow in making a return, deliver the thrust in seconde with the wrist, as you recover.

On the engagement of carte, give him some openings ; if he mark the feints one, two, and thrust, form your counter parade in carte ; then deliver him a quick return with the wrist in low carte, by forming the complete extension. On the engagement of tierce, in like manner, give him some openings : if he mark feints one, two, and thrust, form your counter parade in tierce ; and, on the extension, deliver him a thrust in seconde. On the engagement of carte, if he execute low feints and thrusts, use the circle parade, and return a straight thrust on the extension, before he recovers.

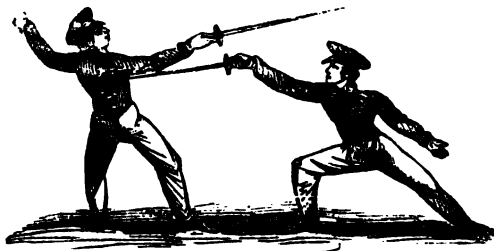


On the engagement of carte, make an appel, or beat with the right foot at the same time beating abruptly on your adversary's blade, which will give you an opening to thrust carte straight home. On the same engagement, make an appel, beat his blade, then disengage, and thrust carte over the arm. On the engagement of tierce, make an appel, beat his blade, and thrust tierce or carte over the arm. On the same engagement, make an appel, beat his blade, then disengage, and deliver a thrust in carte inside. On the engagement of tierce, make your appel, disengage to carte, by beating his blade, and thrust carte inside.

On the engagement of tierce, perform a glizade along his blade, with the extension; if he do not cover himself, deliver a straight thrust in carte over the arm. On the engagement of carte, make a glizade, drop your point, and deliver a thrust in low carte. On the engagement of tierce, perform a glizade, drop your point under his wrist, and deliver a thrust in octave.

On the engagement of tierce, he disengages to carte, then disengage contrarily, and thrust home carte over the arm. On the engagement of carte, when you find that your adversary holds his hand too low upon guard, and deviates from the guard rules, seize the opening, by pushing carte straight home. On the engagement of tierce, having the like opportunity, deliver the thrust of carte over the arm, straight home.

On the engagement of carte, your adversary disengages to tierce; that instant disengage contrarily, (that is, to carte,) and push home. (*Vide cut.*)



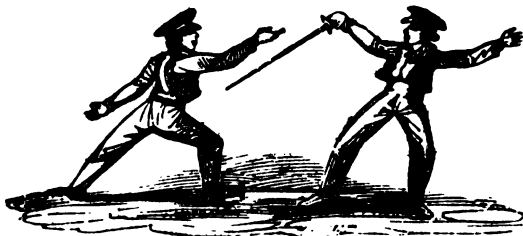


THE SALUTE PREVIOUS TO AN BOUT.

On the engagement of tierce, make two quick appels, or beats, with the right foot; bring it close behind the left, near the shoe-tie, raising and stretching your right arm with the nails upward, and the point of your foil dropped; at the same time, take off your hat gracefully, and hold it in your left hand, stretched down near the flank; then, with a circular motion of the wrist, as if forming the counter in tierce, throw your left foot backwards, to the distance of your common guard, and raising your left hand, make two other appels; bring your left foot forward to the former position, that is, before the right, near the shoe-tie; at the same time, stretching your arm, with the nails upward as before, and in that position, form gracefully the parades of carte and tierce; make a circular motion with the wrist, and advance your right foot, with vivacity, to your original guard, at the same time covering your head. All the movements in this salute should be performed in a more lively manner than those described in the salute previously to thrusting carte and tierce: observe, also, that these movements should keep exactly the same time with those of your adversary.

DISARMING.

After parrying your adversary's thrust by simple carte, or the counter in carte, without quitting his blade, lean abruptly thereon, and binding it with yours, reverse your wrist, with the nails downward, as if in seconde, and with the motion thereof, give his blade an abrupt twirl. (*Vide cut.*)



If this do not disarm him, it will throw his hand and blade out of the line of direction, so that you may effectually fix your point, and deliver him a thrust in seconde.



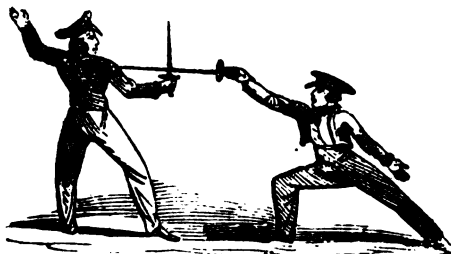
FENCING.

305

Also, after parrying by simple tierce, cross his blade before he recovers ; make a strong and abrupt circular movement with your wrist in seconds without quitting his blade, and it will either disarm, or give you an opening to deliver him a thrust.

PRACTICAL OBSERVATIONS.

Assume a bold air and steady position ; fix your eyes firmly on those of your adversary, so that he may not penetrate into your designs ; and keep your proper distance and measure. It is a most essential point in assaults, exactly to know these : for this purpose, observe the height of your adversary, the length of his foil, &c., and make the necessary allowances accordingly. If he make frequent practice of disengaging, beating your blade, and otherwise embarrassing you, with a view to get openings, you may seize the occasion to deliver a time-thrust, taking care to cover yourself well, by forming a good opposition against his blade. When on the engagement of *carte*, by way of snare, hold your point higher than usual ; if he attempt to make a cut over the point, that instant disengage contrarily and thrust *carte* inside ; or you may, in preference to this, deliver a straight thrust in *carte* over the arm. (*Vide cut.*)



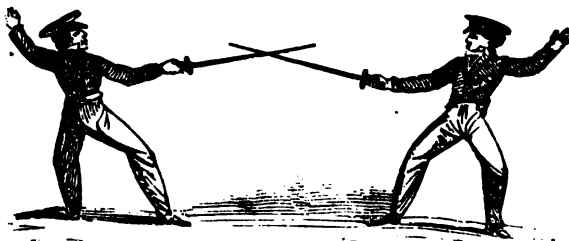


too great a distance, and have not that necessary command of throwing your body back far enough, when he advances and makes a full lunge; neither can you retreat, or make returns with the necessary quickness; the lower part of the body is also more exposed than it would be on a proper medium guard.

Never extend yourself too far on the lunge, as it impedes your recovering to guard with the necessary quickness. Always endeavour to recover quickly, and with as much ease as possible, fixing your point to your adversary's body, and forming the most natural parade, in case he should make a quick return. If engaged with an adversary of a shorter stature, attack him on the engagement of tierce, as being more advantageous for a number of feints and thrusts than the engagement of carte, particularly for feint seconde over the arm, &c.

If your adversary advance within his measure, and force in a straight thrust, carte over the arm, or in tierce, then raise and bend your arm, forming the parade of prime, and quickly return a straight thrust in prime, before he recovers; or, if you have not opening sufficient, disengage over his arm, and deliver a thrust in seconde.

When you first enter upon the assault, you may engage your adversary's blade out of measure in carte, as being easier than the other engagement for executing your different movements. (*Vide cut.*)



When you engage your adversary's blade, act on the defensive for some time, in order to discover what feints or thrusts he prefers. Vary your parades as much as possible, so that he may not, in turn, ascertain your own favorites; for, if a good fencer be found to use one parade in preference to another, he may be deceived with much less difficulty than might be imagined.



ed, and, eventually, be touched, by a person far less skilful than himself. A learner, therefore, should practice all the parades, and change them continually, or, at least, as often as opportunities occur. He should endeavour to go from the high to the low parades, and from the latter to the former, with the utmost possible agility, until, by practice, he is enabled to parry almost every thrust.

If you engage the blade in *carte*, cover your inside a little, and if in *terce*, cover your outside, to present straight thrusts on those engagements. When attacking, it is well to disengage dexterously, outside and inside, forming your extension as if you intended to thrust; if this plan do not afford you some openings, it will, at least, in all probability, be the means of discovering your adversary's choice parades. If he use simple parades only you may easily deceive him by making feints one, two, or one, two, three. If, on the contrary, he be a skilful fencer, and use various counter-parades you must endeavour to embarrass him, by *appels*, *bents* on the blade, *extensions*, *glizades*, counter-disengagements, &c

cc





DELAUNAY'S BOWER.



This cut represents, it is said, the Maze at Woodstock, in which King Henry placed Fair Rosamond. It certainly is a most ingenious puzzle, and consists in getting from one of the numerous outlets, to the Bower in the centre, without crossing any of the lines.







DRAUGHTS.

THE game of Draughts is said to be of great antiquity, but we cannot discover that it was much known in Europe until the middle of the 16th century. In 1663 an elaborate treatise on the game was published by a Parisian pro-



reference to the above, or any other writers upon Draughts, superfluous except to the most curious and finished adepts in the game.

RULES FOR PLAYING.

In playing Draughts, the table must be placed with an upper white corner toward the right hand; and for the sake of playing the following games and preliminary practice, the numbers may be written upon the board itself, near a corner of each square; or a table may be drawn upon a card, and the squares numbered, as in the figure: such a table will be a ready guide to any move directed.

	1		2		3		4
5		6		7		8	
	9		10		11		12
13		14		15		16	
	17		18		19		20
21		22		23		24	
	25		26		27		28
29		30		31		32	

The game is played by two persons, each of whom takes a set of twelve men of different colors, generally white and black, but they may be of any colors, according to the fancy. One player, of course, takes all the men of one color, and the other all those of the other color. The

black pieces are to be placed on the first twelve white squares, and the white on the last twelve white squares, or *vice versa*.

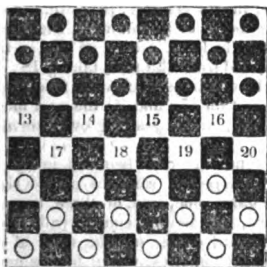
When the pieces are thus placed, each player alternately moves one of his men forward, angularly, to the next white square; and when moved to a square adjoining to an enemy, and another square next angularly behind the man so moved is unoccupied at that time, or afterward becomes so, then the man so placed or left unguarded must be captured by the enemy, whose man leaps over to the vacant square, and the prisoner is taken off the board.



DRAUGHTS.

329

one of the front rank can be moved, he must either move the man on 21, to 17; that on 22, to 17 or 18; that on 23, to 18 or 19; or, that on 24, to 19 or 20. From 22 to 18 is supposed to be the best first move; we will, therefore, imagine that white makes it. It is black's turn to move a piece; he, like his adversary, can only advance one of his front rank men; he may move the man on 9, to 13 or 14; that on 10, to 14 or 15; that on 11, to 15 or 16; and that on 12, to 16 only. The white having moved from 22 to 18, the black then may move, if he please, from 11 to 15. In the next move, the



white man on 18, will take the man so placed by black on 15, by leaping over his head into 11. It is now black's turn to move, and he, in return, can take white's man which stands in 11, by either of the men standing on 7 or 8. In case he makes the capture with 7, he jumps over the head of the man to be taken, into 16; if he prefer taking him with 8, the move, for that purpose, is from 8 to 15. An opportunity, here occurs, of giving a practical explanation of the huff. Supposing, when black had moved from 11 to 15, white

had omitted to take him, in the manner we have just explained, and made some other move, white, in this case, would have "stood the huff;" that is, black might have taken away the white man that stood on 18, or compelled white to have taken him, which he pleased. This is "standing the huff;" and, be it recollected, that so taking off the man from 18, is not to be considered as a move, black having his move after having so done, before white can move again.

In case the game were in a more advanced state, and that the black man, which, at the beginning, stood on 4, had been removed, the white man on 18, instead of taking only the black man on 15, would have taken the black man on 8, in addition, by leaping over 15 into 11, and over 8 into 4, which would be reckoned as one move. In this case, the man in 4, having reached



We will now give a practical example or two of the "kingly powers" of these "crowned heads." Supposing a black king stood on 29, a white king on 25, a white man on 18, another white king on 19, and a third white king, or a white man, on 27,—if it were black's move, and the board was clear, except only of the pieces that are mentioned, he would take them all thus: from 29 to 22, taking 25; from 22 to 15, taking 18; from 15 to 24, taking 19; and from 24 to 31, taking 27. If, however, the black king only take the first, second, or third of these pieces, he would stand the huff, (i. e.) the adversary might remove the black king off the board, or compel him to take the piece or pieces in his power, at his, the adversary's, pleasure.

To show the difference between the moves of a man and a king more clearly, suppose, instead of a king, black had only a man on 29, in that case, the man might go to 22, taking 25, and from 22 to 15, taking 18; but here his exploits would end, as he could not move backward from 15 to take 19, but, on the contrary, he must rest on 15; and, at the next move, would himself be taken, by the white king, on 19, jumping over his head into 10.

When all the men, on one side, are taken, or so hemmed in by the opposite color, that they cannot move, the person who has played them is beaten. If, at the latter end of the game, one, two, or three, more or less, of each color, be left on the board, and neither can prevail on the other to risk, or if one who is weaker than, or has not the move of the other, be determined to go to and fro in safe squares, where he can never be taken, the game is called drawn, and given up, neither party winning. The way to give the finishing stroke to a game, where one color has two kings, and the other but one, or where one is, in any respect, a little stronger than the other, will be found in the following pages; as also hints for a weak color making a drawn game, when the stronger adversary is in such a situation, as to be unable to get out his pieces to make an attack on the weaker party.

LAWS OF DRAUGHTS.

The following are a set of laws for the game, which have been sanctioned by the first players of Draughts in the kingdom.

1. Each player takes the first move alternately, whether the last game be won or drawn.

2. Any action which prevents the adversary from having a full view of the men is not allowed.



DRAUGHTS.

325

5. If either party, when it is his turn to move, hesitate above three minutes, the other may call upon him to play; and if, after that, he delay above five minutes longer, then he loses the game.

6. In the losing game, the player can insist upon his adversary taking all the men, in case opportunities should present themselves for their being so taken.

7. Persons not playing are not to advise, or in any manner interfere with the game of either party.

8. To prevent unnecessary delay, if one color have no pieces but two kings on the board, and the other no piece but one king, the latter can call upon the former to win the game in twenty moves: if he do not finish it within that number of moves, the game is to be relinquished as drawn.

9. If there be three kings to two on the board, the subsequent moves are not to exceed forty.

GAMES FOR PRACTICE.

It is now time for us to lead our pupil from theory to practice; for this purpose we shall proceed to lay before him a few games and situations, which he can either play alone, or with another, on a marked board, such as we have previously described. And here we feel it necessary to remark, that it will not be sufficient merely to go over the moves indicated in the following pages; by so doing, much time will be lost, and little learned: it is indispensable, if the learner be desirous of obtaining any benefit from these games, that he should carefully look to each series of moves, and, if possible, improve upon them as he goes on. The position of a single piece may totally defeat the best attacks, and it is not to be supposed that any two players will ever, except by some extraordinary accident, make all the identical moves, set down in the ensuing games. Still, however, much may be done by a few schemes of moves; especially, as toward the end, the positions of the men are very frequently similar, and we feel convinced,



positions of the board, so that the men placed in the proper positions for the moves can be marked in, may be had, reasonably, at the ivory turners. A book of this sort, containing charts of games, and memoranda of moves, by experienced persons, would be invaluable to the young Draught-player. We shall reserve any further remarks on Draughts for our concluding observations, and now proceed at once to the tables and games.

The letters, N. C. F. T. at the head of each of the games, stand for *number, color, from, to*.

GAME 1, in which White loses by the twelfth move.

N	C	F	T	N	C	F	T
1	B	11	15	28	W	30	25
2	W	22	18	29	B	29	22
3	B	15	22	30	W	26	17
4	W	25	18	31	B	11	15
5	B	8	11	32	W	20	16
6	W	29	25	33	B	15	18
7	B	4	8	34	W	24	12
8	W	25	22	35	B	18	27
9	B	12	16	36	W	31	24
10	W	24	20	37	B	14	18
11	B	10	15	38	W	16	11
12	W	27	24	39	B	7	16
13	B	16	19	40	W	20	11
14	W	23	16	41	B	18	23
15	B	15	19	42	W	11	8
16	W	24	15	43	B	23	27
17	B	9	14	44	W	8	4
18	W	18	9	45	B	27	31
19	B	11	25	46	W	4	8
20	W	32	27	47	B	31	27
21	B	5	14	48	W	24	20



DRAUGHTS.

327

Game 2, a drawn game.

N	C	F	T	N	C	F	T
1	B	11	15	28	W	30	25
2	W	22	18	29	B	6	9
3	B	15	22	30	W	18	6
4	W	23	18	31	B	1	10
5	B	8	11	32	W	22	18
6	W	29	25	33	R	14	18
7	B	4	8	34	W	23	14
8	W	25	22	35	B	16	30
9	B	12	16	36	W	25	21
10	W	24	20	37	B	10	17
11	B	10	15	38	W	21	14
12	W	21	17	39	B	30	25
13	B	7	10	40	W	14	9
14	W	27	24	41	R	11	15
15	B	8	12	42	W	9	6
16	W	17	13	43	B	2	9
17	B	9	4	44	W	13	18
18	W	18	9	45	B	15	15
19	B	5	14	46	W	6	2
20	W	24	19	47	B	7	10
21	B	15	24	48	W	2	6
22	W	28	19	49	B	10	14
23	B	14	17	50	W	6	9
24	W	32	27	51	B	25	21
25	B	10	14	52	W	31	26
26	W	27	24	53	B	14	17
27	B	3	7	&c.	W	drawn.	

Game 3, which is lost by 30th move.

N	C	F	T	N	C	F	T
---	---	---	---	---	---	---	---



GAME 3, continued.

N	C	F	T	N	C	F	T
9	B	15	24	25	B	16	20
10	W	28	19	26	W	31	27
11	B	11	16	27	B	13	17
12	W	23	21	28	W	30	26
13	B	6	9	29	B	1	6
14	W	29	25	30	W	18	15
15	B	9	18	31	B	20	14
16	W	23	14	32	W	27	20
17	B	16	23	33	B	7	10
18	W	26	19	34	W	14	7
19	B	4	8	35	B	2	27
20	W	25	22	36	W	21	14
21	B	8	11	37	B	6	9
22	W	22	18	38	W	33	23
23	B	11	16	39	B	9	27
24	W	27	23	40	W	loses.	

GAME 4, which is lost by 12th move.

N	C	F	T	N	C	F	T
1	W	22	18	19	W	21	17
2	B	11	16	20	B	1	6
3	W	25	22	21	W	17	13
4	B	10	14	22	B	3	7
5	W	29	25	23	W	28	24
6	B	16	20	24	B	12	16
7	W	24	19	25	W	26	23
8	B	8	11	26	B	8	12
9	W	19	15	27	W	23	19
10	B	4	8	28	B	16	23
11	W	22	17	29	W	31	26
12	B	7	10	30	B	7	16



DRAUGHTS.

329

CONCLUDING REMARKS

Even those who have some knowledge of the game of Draughts will, we have no doubt, derive much benefit from a perusal of the foregoing pages, and become enabled to defeat those by whom they have previously been beaten. A person who has never acquired any insight into the game may, we flatter ourselves, from the care which we have taken in preparing the treatise, acquire considerable proficiency, by a proper attention to our rules and instructions.

The few remarks which we are about to make, as to one circumstance in Draughts, could not, we conceive, be so aptly introduced anywhere else as here; we allude to the importance of having the move upon an antagonist. The value of this will, no doubt, have frequently occurred to the reader, in the course of the preceding games; but there are situations, when it is not only useless, but detrimental. To have the move when your men are in a proper position, upon an open board, will often, in a short time, give you the power of forcing your adversary into such a situation as will render his defeat certain; but, having the move, when your men are huddled in confusion together, and you are unprepared to point an attack from any quarter, that is to say, when you are strong in number, but powerless in position, will, not unfrequently, cause you to lose the game.

In order to know whether any one of your men have the move over one of your adversary's, you must carefully notice their respective positions, and, if your opponent have a black square on your right angle under his man, you have the move upon him. This is a general rule, and will apply to any number of pieces. To illustrate it with an instance: if white have a man on 22, it being his turn to play, and black's man be on 11, white has the move. A modern writer on this subject, gives another method of ascertaining whether a party, whose turn it is to play, has the move; namely, by counting the squares and the men; and if the squares be odd, and the men even, or the men odd, and the squares even, then the party whose turn it is to play has possession of the move: thus, if there be a black man on 19, on 26 a white king, on 28 a black king, and on 32 a white man, and white



Persons who know but little of this game are sometimes found talking lightly of it, as a trifle undeserving of attention; to such speakers we quote the following passage from Dr. Johnson's dedication of Payne's Book on Draughts.—"Triflers may think or make anything a trifle; but since it is the great characteristic of a wise man to see events in their causes, to obviate consequences, and ascertain contingencies, your lordship will think nothing a trifle by which the mind is inured to caution, foresight, and circumspection."

In conclusion, we beg to assure our young readers, that, simple as it may appear, they will never be able to attain any proficiency in this game, without some study, and much caution.





CHESS, or all sedentary games, is undoubtedly the most eminent. It is played in every civilized nation in the world, from Siberia to Rome—from Iceland to the wilds of Africa; and has been the delight of emperors, kings, warriors, philosophers, and mankind in general, for ages past. Various accounts have been given of its origin. Some say, it was

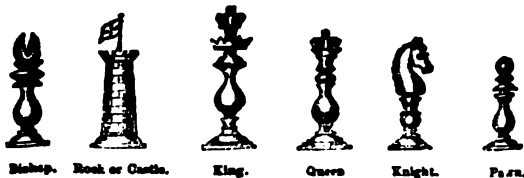


to come to us from Persia, through Arabia ; as most of the terms employed in the game are either corruptions or translations from the Persian or Arabic words. Thus, check is plainly derived from the Persian *schach*, or king ; and *mat*, in the same language, signifies dead ; hence check-mate, or, the king is dead.

Although Chess can be traced back to the most remote antiquity, we have no satisfactory proofs of the place where, or the person by whom it was invented. But, whoever he was, it is certain that he must have been a man of profound thought. It has been without a rival for centuries, and is as much admired in our day as it was a thousand years ago. It may be called a representation of war in miniature ; two little armies, of different colors, are drawn up opposite each other in the order of battle, with their castles, their kings and queens, their knights, bishops, and common soldiers, prepared for mutual attack, and to take prisoner the king of the opposite party.

Chess is highly beneficial to the improvement of the mind ; nothing in it is governed by chance—judgment is every thing. A player therefore cannot lay the blame of his losing on fortune, but must ascribe his miscarriages to deficiency of judgment, or inattention ; and for this reason it is the most interesting of games. It acts strongly too on the sense of honor ; irascible persons should therefore avoid it, unless they have learnt to acknowledge that the acutest minds may be guilty of an oversight. Chess has one splendid advantage over almost all other sedentary games : that its lovers do not play at it for wagers, the honor of the victory being the only reward of the conqueror.

THE VARIOUS PIECES.



Bishop.

Rook or Castle.

King.

Queen.

Knight.

Pawn.



CHES.

333

THE KING.

The king is the most important piece at Chess ; the sole object of the game is to hem him in, so that he cannot move without going into such a situation as would render him liable to be taken if he were not a king. He is then check-mated, and must surrender. He steps only from one square to the next at a time, but in any direction whatever, either forward, backward, sideways, or diagonally. He can also take any of the enemy's men in any square adjoining to him, so that he does not place himself in check ; that is, in such a situation as, if he were not a king, he could be taken by the enemy. The king however is never actually taken ; but, if he be checked by one piece, and can neither take the hostile man, interpose any of his own, nor move into any other square without being in check from another, he loses the game. Whenever the king is in check, the adversary must say "check," to him, which is a warning either to defend himself by his other pieces to take the man who assaults him, or to move into a place of safety.

THE QUEEN.

The queen is, in point of power, the best piece on the board. She moves, like the king, in all directions, and as far as she pleases, but at one move, and provided the squares be unoccupied in her line of motion.

THE ROOK, OR CASTLE.

The rooks, or castles, are next in importance to the queen. Their motion is backward, forward, and sideways. And they may move as far as the field is open.

THE BISHOP.

The bishop moves diagonally, as far as the squares are open, in any direction. The bishop therefore always keeps the same colored squares as that on which he is placed at the beginning of the game.

THE KNIGHT.

The knight is particularly useful at the beginning of the game, and



A knight may be placed on any one square of the board, and conveyed hence into every one of the other squares in sixty-three moves. We subjoin an example of this curious problem at the end of the article.

THE PAWNS.

The pawns are of great consequence in defending the king ; and are very useful in attacking and repelling the pieces, under the management of a good player. If a pawn can proceed across the field to the rear line of the enemy, that is from 2 to 8, or from 7 to 1, he is exchanged for a queen, or any other piece of his color that he chooses to demand. Thus, you may have a second queen, even though you should have lost none of your pieces. The pawn moves strait forward, and only a single square at a time ; except on its being first moved, when the player may advance it either one square or two, as from 2 to 3 or to 4, and from 7 to 6 or to 5 ; or when one takes a man from the enemy, which is always done diagonally, or across the corners of the squares. But a pawn cannot move two squares forward, when the square over which he leaps is so viewed by an enemy's pawn, that the latter could take him in that square. For example, the pawn G 2 cannot be moved to G 4, if there be an enemy's pawn on H 4 or F 4, without that pawn's having option of taking him on G 3, as he passes.

THE CHESS BOARD.



The common draughts-board, containing sixty-four squares, one half white and one half black, is also a chess-board. It is so placed that each player has a white square at his right-hand corner. There are eight rows of squares, which, in the cut, are marked A to H ; and eight rows in the cross direction, 1 to 8. Thus, any square may be readily pointed out ; for instance, the square x on the figure will be indicated by D 5 ; and if a man were to be moved from x to y, this would be expressed by the



CHESS.

335

The square in the corner, at the right hand of the player who has the white men, is the white king's rook's square ; that before it, the white king's second square ; the next, his third square ; and the following, his fourth square. This meets the black king's rook's fourth square ; and thus the row proceeds, through the black king's rook's third and second squares, to the black king's rook's square, at the left-hand corner of the player with black. The same mode is adopted by all the rest ; the pieces on the queen's side of the board being distinguished as the queen's rook, knight, and bishop.

PLACING THE MEN ON THE BOARD.

The rooks occupy the four corners of the board ; the knights stand next to these ; the bishops next to the knights ; the queens on D-1 and D-8 ; and the kings on E-1 and E-8. Thus, the pieces or officers, stand opposite each other respectively, at different sides of the board : the queens being on the squares of their own color, and the kings the contrary. The row immediately in front of the officers is occupied by the pawns. The value of the men has been estimated as in the following proportion to each other :—the queen, 95 ; a rook, 60 ; a bishop, 30 ; a knight, the same as a bishop ; the king (estimated as a fighting piece) 26 ; a pawn, 8, or rather more, from its chance of promotion, by being moved to a square that entitles its player to exchange it for a queen, or any other piece he chooses to demand.

LAWS OF THE GAME.

1. Each player marches his men forward, gradually, against those of the enemy, or retreats when the game is open behind them, except only as regards the pawns, which can only move forward. Each party moves alternately, one man at a time.

2. In each game, the players have the first move alternately, except where one gives the other the advantage of a piece or a pawn in which case, the party by whom such piece or pawn is given is entitled to the first move.

3. If you misplace your men at the beginning, and play four moves your adversary may permit you to begin the game afresh, or not as he pleases.

4. If you touch a man, you must play it, except it would discover



5. If you touch one of your adversary's men, he may insist upon your taking it, if you can ; if not, you must move your king, if that be possible, without putting him in check.

6. You cannot castle after moving the rook or king ; if you attempt to do so, your adversary may insist on your moving one of those pieces, at his option.

7. If you make a false move, such as moving one of your opponent's men in mistake for one of your own, taking off one of your own pieces instead of his, &c. your opponent can oblige you to replace such move, and move your king, if you can do so without placing him in check ; but if he have played before he notices your false move, neither of you can, afterwards, recall it.

8. If your opponent challenge you with a check, without, in fact, your king being in check, and you, in consequence, move your king, or any other man, you may retract such move, if you discover it before he has made his next move.

9. If your adversary give you check without warning, or saying "check," you are not obliged to notice it till he does ; but if, on his next move, he warn you, each party must retract his last move, and the check be provided for as if just given.

10. You must not check the opposite king with any piece, by moving which to do so you expose your own king to a check.

11. If the king be not in check, but cannot move without going into check, and have no piece or pawn left, or even none that can be moved, he is stale-mated, and the game is drawn.

PLAYING, CHECKING, CASTLING, &c.

It is usual to begin with advancing the king's pawn two squares ; that is, from E 2 to E 4, or from E 7 to E 5 ; because this opens the way for the king's bishop and the queen. It is however perfectly optional ; this, as well as all the rest of his moves, being regulated either by some plan which the player has formed for attacking his enemy, or as he may find a necessity of defending himself from his enemy's attack. The object of the game, which is to give the enemy check-mate, can scarcely be effected without some settled plan. The player must look forward through a considerable number of moves, which will be requisite to bring his men into a given position, and also to provide, from time to time, against his antagonist's attempts to frustrate his design, or attack him in turn. He must seek to penetrate his adversary's plots from the moves he makes. He is not obliged to take a man when it is in his power ; but, when he does, the man, with which he takes it, must be placed on the square occupied by the man taken.



When the king is in such a situation that another move could take him, were he not king, he is in check. The modes of extricating the king from check are as follow :—If the man that checks him be in an adjacent square, the king may take such man if he be not guarded ; that is, if another man of his own color have it not in his power to move into the square in which the man is placed if he be removed from it ; since, in this case, the king would place himself in check again. For example, suppose the king in E 1, and an enemy's pawn, advanced to D 2, give him check ; the king cannot take the pawn, if the enemy have another pawn, or a bishop in C 3 or F 3, or a rook or queen anywhere in the open row D D, &c. The man that checks may also be taken by some other man, to whose attack he is open ; or a man may be placed between the king and the checking man (unless it be the knight) if there be a vacant square between them. Lastly, the king may be moved into another square which is not commanded by the adversary's pieces. The king is check-mated, and the game is lost, if he cannot extricate himself by either of these moves. A king cannot go into a square next the opposite king ; he cannot therefore give check ; because, in doing this, he would go into check himself.

Castling is allowed once in a game. It consists in moving the king two squares to the right or left, and bringing the rook on that side to the square adjoining the king on the other. Thus the king may be moved from E 1 to G 1, and the rook brought from H 1 to F 1 ; or the king may be moved to C 1, and the rook from A 1 to D 1. For castling, that side is preferable on which the king will be most secure from attack ; for this purpose the three pawns on F, G, H 2, are kept in reserve, in order that he may retreat behind them ; it being generally stronger play to castle with the king's rook than the queen's. Castling is not allowable when the king, or the rook, with which you would castle, has been moved ; when the king is in check, or when the king must pass over a square in which he would be checked. Suppose the king would move from E 1 to G 1, he must pass over F 1. But, if there be a queen or rook of the enemy anywhere on the row F, as far as it is open ; or, in short, if F 1 be commanded by any one of the enemy's men, the king cannot castle on that side, neither can he do so when there is a man between himself and the rook.

GENERAL INSTRUCTIONS.

If the king's pawn be advanced two squares, and the queen's one square, an opening is made both for the queen and the queen's bishop to the king's side of the board ; and the king's pawn cannot be taken, without the queen's pawn taking the adversary's man in turn, and sup

EE



playing his piece. If two pawns be advanced side by side, neither defends the other; this is sometimes done to further a plan of attack; the pawn sacrificed on these occasions is called the gambit pawn. After the pawns are advanced a certain way, the knights may be brought forward, either to support them, or act upon the offensive.

The plan of attack should be gradually formed from the commencement of the game, and each step taken should have a tendency to forward it, unless when it is necessary to thwart the plan of the adversary. The player must not suffer himself to be diverted from a well-concerted project by any collateral advantage; for the taking of a pawn or piece may prove injurious when it leads to a deviation from the principal object. If your plan be discovered and frustrated, it is better to form a new one than to persevere in the old. Your plan should not only be concealed from your adversary, but you must also discover, if possible, what your adversary can do to counteract your moves. A plan may be most effectually concealed by excluding the queens and rooks, or by executing it through the agency of inferior pieces or pawns, or by masking the pieces intended to effect it behind men which are apparently indifferent. The skillful player, if his moves be calculated with precision, will sacrifice his most important pieces without hesitation, to mislead his antagonist, or, when necessary to the accomplishment of his plan; nay, he will often do this intentionally, to lead his opponent into the hope of winning, and give his antagonist check-mate, when he fancies he has the game in his hands. It is far more common for a player to conceal his purpose till it is out of his opponent's power to frustrate it, and then to pursue it openly. To give check without having it in your power to follow it up, is, in general, bad play. If your checking piece can immediately be repulsed, you lose a move; never proceed to an attack therefore without good preparation; and if your attack proceed well, do not suffer yourself to be drawn aside after any bait that your antagonist may throw in your way. The object in chess is, to give check-mate, and not to take pieces. Sacrifice your own willingly, when the loss of them will open the line of defence adopted by your opponent.

If a man of the enemy be exposed, examine whether it were left or from necessity, oversight, or design. You do not always gain by taking a piece, you may be check-mated in consequence of taking even a queen. Be not eager to take a pawn in front of your queen; for, as your antagonist cannot take him, he is frequently a better protector than a man of your own. If you cannot save a piece, endeavor to take one of the enemy's; or, by improving your situation, obtain a compensation for the loss. Examine which will be the best, when you can take a piece two or more ways. If your antagonist can take the man



in return, take it with that man which is of the least value. To exchange man for man, occasionally, is good play, or even to exchange a queen for a pawn, when this pawn would prevent you from giving mate, or to exchange man for man, when the enemy's man thus taken is one particularly in action.

Guard your men sufficiently; and if one doubly guarded of the enemy's be exposed to a guarded man of yours, let yours be trehly guarded. The more valuable men should be guarded by those of inferior worth; for, if your opponent guard his inferior piece by another inferior piece, you cannot employ your better piece to take your enemy's, as it would be lost. A far advanced pawn should be well guarded, for it is often indispensable to a check-mate, and may make a queen.

Castling is not always advantageous, as from the confined situation in which it places the king, it sometimes (particularly when the adversary has his knights in play) prevents his escaping out of check. It is, however, possible to retain the power of doing so, and keep the requisite pawns in their places. For as long as you have it in your power to castle, your opponent will be at a loss on which side to direct his attack; when he has decided, and brought his main strength to bear on one side, you can frustrate his design by castling on the other. It is not always good play not to stir the three pawns in front of the king that has castled; for liberty of moving may be necessary, to get the king out of check. Crowd not your men too much together, as this restrains their movements. A man that cannot move is often worse than lost, by standing in the way. Endeavor to crowd your antagonist's game, in which you may succeed, if he bring out his pieces too early, by driving them back with your pawns. Endeavor to open your game by exchanging men in those parts where you want room, if you get unintentionally crowded.

Never make a move without examining whether you be endangered by the last move of your antagonist; nor without calculating whether it will allow your enemy to harm you by his next. Beware of your enemy's knights, as they command different squares at once in a peculiar way. If a knight command the square of a queen or rook, at the same time that he gives check, the piece must be lost unless the knight can be taken; to avoid this, which is called forking, when a knight is near, a good piece should never be kept on a square of the same color as that occupied by your king. Do not let an enemy's pawn attack two of your pieces at once. Beware of two, and still more of three pieces, that manifest a design on the same square. Block up the way to such square by one of your pawns or a guarded piece. Your queen should never stand before your king, as, in such a situation, she may be lost, by a guarded rook being brought in her front.



GAMES FOR PRACTICE.

At the moves to which a * is set, a piece is taken · at † check is given ; ‡ means check-mate.

FOOL'S MATE.

Move. WHITE.

- 1 G 2 to G 4
- 2 F 2 — F 3

Move. BLACK.

- 1 E 7 to E 6
- 1 D 8 to H 4†

SCHOLAR'S MATE.

- 1 E 2 to E 4
- 2 F 1 to C 4
- 3 D 1 to H 5
- 4 H 5 to F 7*†

- 1 E 7 to E 5
- 2 F 8 to C 5
- 3 D 7 to D 6

GAME 2.

- 1 E 2 to E 4
- 2 D 2 D 3
- 3 G 1 F 3
- 4 E 4 F 5*
- 5 F 3 E 5*
- 6 D 1 H 5†
- 7 H 5 F 7‡

- 1 E 7 to E 5
- 2 G 7 G 6
- 3 F 7 F 5
- 4 G 6 F 6*
- 5 D 7 D 6
- 6 E 8 E 7

GAME 4—THE KING'S GAMBIT.

- 1 E 2 to E 4
- 2 F 2 F 4
- 3 G 1 F 3
- 4 F 1 C 4
- 5 D 2 D 4
- 6 B 1 C 3
- 7 H 2 H 4
- 8 H 4 G 5*
- 9 H 1 H 8*
- 10 F 3 E 5
- 11 D 1 H 5
- 12 D 4 E 5*
- 13 E 5 E 6
- 14 E 6 F 7*†
- 15 C 1 F 4*
- 16 F 4 ... D 6‡

- 1 E 7 to E 5
- 2 E 6 F 4*
- 3 G 7 G 5
- 4 F 8 G 7
- 5 D 7 D 6
- 6 C 7 C 6
- 7 H 7 H 6
- 8 H 6 G 5*
- 9 G 7 H 8*
- 10 D 6 E 6*
- 11 D 8 F 6
- 12 F 6 G 7
- 13 G 8 F 6
- 14 E 8 F 8
- 15 F 6 H 6*



CHESS.

341

GAME 5—BLACK BEGINS.

WHITE	BLACK
1 E 7 to E 5	1 E 2 to E 4
2 G 8 F 6	2 B 1 C 3
3 F 8 C 5	3 F 1 C 4
4 Castles	4 G 1 F 3
5 F 8 E 8	5 Castles.
6 C 7 C 6	6 D 1 E 3
7 D 7 D 5	7 E 4 D 5*
8 E 5 E 4	8 F 3 G 5
9 C 6 D 5*	9 C 3 D 5*
10 F 6 D 5*	10 E 2 H 5
11 D 5 F 6	11 H 5 F 7*
12 G 8 H 8	12 F 7 G 8†
13 E 8 G 8*	13 G 5 F 7†

GAME 6—WHITE BEGINS.

1 E 2 to E 4	1 E 7 to E 5
2 G 1 F 3	2 B 7 C 6
3 F 1 C 4	3 F 8 C 5
4 C 2 C 3	4 D 8 E 7
5 Castles	5 D 7 D 6
6 D 2 D 4	6 C 5 B 6
7 C 1 G 5	7 F 7 F 6
8 G 5 H 4	8 G 7 G 5
9 F 3 G 5*	9 F 6 G 5*
10 D 1 H 5†	10 E 8 D 7
11 H 4 G 5*	11 E 7 G 7
12 C 4 E 6†	12 D 7 E 6*
13 H 5 E 8†	12 G 8 E 7
14 D 4 D 5†	

GAME 7—THE KING'S GAMBIT.

1 E 2 to E 4	1 E 7 to E 5
--------------	--------------


GAME 8—THE KING'S GAMBIT.
WHITE.

- 1 E 2 to E 4
- 2 F 2 F 4
- 3 G 1 F 3
- 4 F 1 C 4
- 5 H 2 H 4
- 6 F 3 G 5*
- 7 D 1 H 5†
- 8 H 5 F 7†
- 9 F 7 D 5†
- 10 D 5 E 5†

BLACK.

- 1 E 7 to E 5
- 2 E 5 F 4*
- 3 H 7 H 6
- 4 G 7 G 5
- 5 F 7 F 6
- 6 F 6 G 5*
- 7 E 8 E 7
- 8 E 7 D 6
- 9 D 6 E 7

GAME 9—THE KING'S GAMBIT.

- 1 E 2 to E 4
- 2 F 2 F 4
- 3 G 1 F 3
- 4 F 1 C 4
- 5 C 4 F 7*†
- 6 F 3 E 5†
- 7 D 1 G 4*†
- 8 G 4 F 5
- 9 D 2 D 4
- 10 C 1 F 4*†
- 11 F 4 G 5†
- 12 E 4 E 5
- 13 F 5 G 5*†
- 14 G 5 H 5†
- 15 Castles, and will win the game, from the general superiority of his position. The attack developed in this opening is very dangerous, and difficult of defence.

- 1 E 7 to E 5
- 2 E 5 F 4*
- 3 G 7 G 5
- 4 G 7 G 4
- 5 E 8 .. F 7*
- 6 F 7 E 6
- 7 E 6 E 5*
- 8 E 5 .. D 6
- 9 F 8 G 7
- 10 D 6 E 7
- 11 G 7 F 6
- 12 F 6 G 5*
- 13 E 7 E 8
- 14 E 8 E 7

STALE-MATE.

We have already stated, that if you have no pawn or piece, except the king, on the board, that you can move consistently with the laws of chess, and, at the same time, if your king, not being already in check, cannot move without going into check, a stale-mate ensues, and the game is drawn, being won by neither party.

CAPPED PAWN, OR MARKED PAWN.

A player sometimes engages to give mate with a particular pawn marked for the purpose. This is called a Capped Pawn, and is ges



CHESS.

343

erally marked by a ring placed on it, from which it is sometimes termed the "ring pawn." It is a variety of chess seldom introduced, and can only be interesting between a good player and a mere beginner.

FORCED STALE MATE.

Forced stale-mate is where, in the progress of the game, one player engages to force the other to give him stale-mate, or else to lose the game. As this is rarely practised, we merely introduce it to render our subject as complete as possible.

FORCED CHECK MATE.

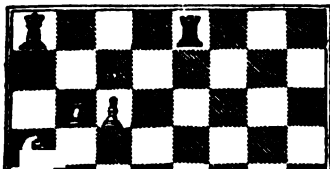
In this game, that party wins who succeeds in obliging the other to give him check-mate. This, we need scarcely observe, is quite the reverse of the usual game, and a mere device of experienced players, to show their skill.

CURIOUS PROBLEMS.

It affords us gratification to be enabled to lay before our readers the following few Diagrams, which we have personally proved, from a very old and scarce Spanish author, Damiano, the earliest practical writer on chess, with the accompanying explanations, translated from the original, expressly for this work.

No. 1.

White offers to give check-mate in two moves.

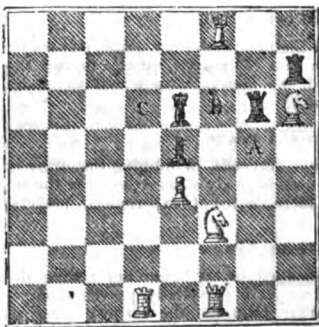


White's first move will be the pawn to A, and if Black then check with the rook, White will cover by his knight, and, in so doing, check-mate the Black king with the castle. If Black, after White has moved his pawn as above, place his castle in C, White will make his move a queen, and so check



No. 1.

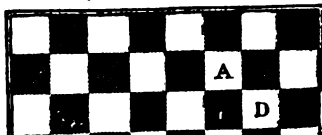
White undertakes to mate in three moves.



White checks by playing the knight to the square marked A. Black is compelled to take the knight with his castle. White then checks with his castle at square B. Black king takes the rook, and is check-mated by White moving his other rook to C.

No. 4.

White undertakes to check-mate with the pawn, in four moves.



To effect this, White's first move is the king to A. His second, the bishop to B. His third, the bishop to C. And

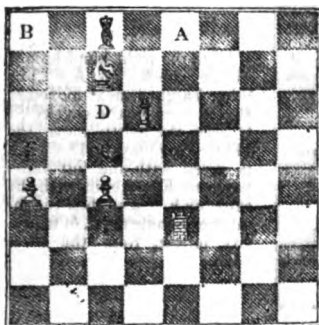


CHESS.

345

No. 4.

*White check-mates with his rook's pawn,
in five moves.*



First. White checks with his rook on A ; he then moves the same piece to B. Next, check is given with the pawn on C. Again on D. And mate with the other pawn on E.

No. 5.

White to mate with a pawn in six moves.

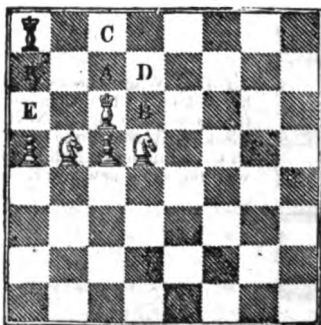


White's first move is the knight to A. His second, check with the rook on B. His third with the same on C.



No. 6

White will give check-mate in seven moves.



With the right-hand knight White checks on A. The other knight is next moved to B, and then White checks on C. On the fourth move, the White king plays to D. Check is given with the left hand pawn on E. Again with the same on F. And then the fatal check-mate must, of necessity follow, from the other pawn.

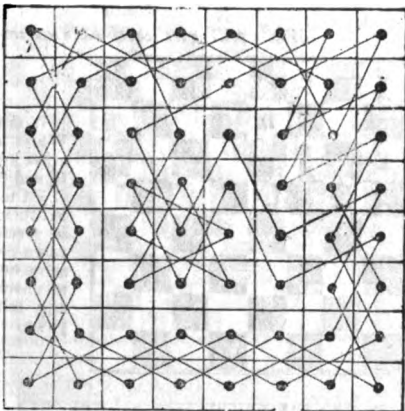
MOVING THE KNIGHT OVER ALL THE SQUARES ALTERNATELY.

The problem respecting the placing the knight on any given square, and moving him from that square to any house on the board, has not been thought unworthy the attention of the first mathematicians. Euler, Ozanam, De Montmort, De Moivre, De Majron, and others, have all given methods by which this feat might be accomplished. It was reserved however for the present century to lay this down on a general plan; and the only English writer who has noticed this, is Mr. George Walker, in his "Treatise on Chess." The plan is this:—Let the knight be placed on any square, and move him from square to square on the principle of always playing him to that point, from which, in actual play, he would command the fewest other squares. Observing, that in reckoning the squares commanded by him you must omit such as he has already covered. If too there are two squares, on both of which his power would be equal, you may move him to either. Try this on the board with some counters or wafers, placing one on every square; and, when you clearly understand it, you may astonish your friends by inviting them to station the knight on any square they like, and engaging to play him, from that square, over the remaining sixty-three in sixty-three moves. When the Automaton Chess-player was last exhibited in England, this was made part of the wonders he accomplished, though as the above plan was not then known here, he



could not adopt it, but used something like the method laid down by Euler, and which we subjoin.

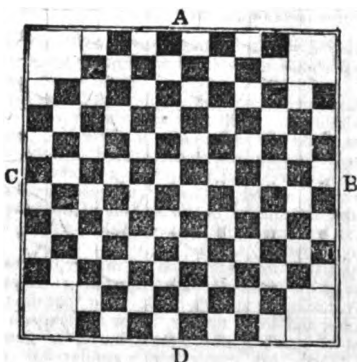
Our young Chess-player's instructor in the game will show him that as this is a re-entering series of numbers, or interminable route, it does not matter on which of the squares the knight is placed at starting, as, by acquiring the plan by heart, which is soon done, he can play him over all the squares from any given point, his last square being at the distance of a knight's move from his first. It is obvious that this route may be varied many ways, and we have often amused ourselves by trying to work it on a slate.



EULER'S METHOD.

DOUBLE GAME OF CHESS.

The Double game of Chess, said to have been invented by Mr. C. H. Wilkinson of Bath, in 1804, is played upon a board containing 128 squares. The board is divided into twelve compartments on each side, leaving a blank space at each corner, equal to four squares. The men are placed, as usual, in the situations of A B C D, and should be of different colors. Two sets of men will be requisite. The partners or allies in the game sit side by side, as A B C D, so that they may be able to communicate their intentions to each other. Supposing C D to be the antagonists of A B—C D or A B must both be check-mated before one or the other be conquered. If any of the players be check-mated, his men remain powerless and inactive, and can neither be moved nor be taken. But should his ally be able to relieve him, he may immediately return to the charge, and the whole of his men come into power as before.



The moves are the same as in common Chess—therefore the parties are in fact exposed to a cross fire, combined with the resistance of his antagonist before him. If any game be calculated to make the players look about them, this is the one. The interest it excites is beyond description, and is greatly increased by affording liberty of communication between the parties interested. The diagram exhibits at once the form of the board and the situation of the players

THE AUTOMATON CHESS PLAYER.

As our subject would hardly be deemed complete without some allusion to the celebrated automaton chess-player, which at two several periods was exhibited in England, and also in this country, we remind the reader to turn back to page 187 of this volume, and he will have a full account of the

Automaton Chess-Player.





CONCLUDING OBSERVATIONS.

Thus have we dallied and toyed with this royal game, until it has reached a length which its importance alone could warrant. Our duty rather than our inclination now urges us to conclude. Fain would we have added a few rich and racy anecdotes of chess-playing, before we closed, but our limits will not allow it. Willingly would we have spoken of that famous king, who made his castle court a chess field, on which the pieces played were living squires, some attired in murrey and cloth of gold, others in costly vests of ethereal blue, powdered with silver stars. While knights, armed cap-a-pi, gorgeous as for a tournament, pranced over the checkers, at the bidding of the king and his rival in the game, who governed the moves of that splendid field from a canopied balcony above.

We should not have forgotten that irascible scion of royalty, in the olden time, who, when beaten by his brother, took up the massive chess board, and, most unfraternally, broke his victor's head. Nor that man, who, by often playing with a hot and testy master, knew his temperament so well, that the instant he made a check-mate move, he flew like an arrow from the room, to save his scone from a similar fate to that of the royal player, to whom we have just alluded. Nor, to that great individual, who, being under sentence of death, received a peremptory summons to the fatal block, when playing a game of chess, and begged that the officer who came to lead him to his doom would bear witness that he had the best of the game.

Had we "ample scope and verge enough," we would, with a surpassing pleasure—to ourselves at least, if not to our readers—relate the mode and manner of our own acquirement of the game. It was under the tall and stately elms of Gray's Inn Gardens where we first learnt to know what check and check-mate meant. Many a night and oft have we, then just emerging from our boyhood, glided forth through a private gateway into that quiet place, and spreading our board upon the grass, played by the light of a full summer moon, until the world, and all that moved upon it, except the kings, the queens, the knights, and those "stout men at arms," on the pigmy field beneath us, were forgotten. Our tutor in the game was a fellow student of that science which grave professors teach in all the inns of court. A world of wa-



on the summit of the Andes; check-mating an Abyssinian chief, or having assumed the turban of the Moalems, is squatting in a bower and playing chess, in outward appearance.





DEAF AND DUMB ALPHABET.

Though new grown old, she had a golden joy;
Her dim eye brightened oft, to see her boy—
Albeit by Heaven deprived of speech and hearing—
Throw by his homely toy,
And tell his love in manner so endearing:
Upon his nimble fingers, that she thought
Him more endowed than those bereft of nought.



THE ALPHABET.

A, E, I, O, U. The vowels *a, e, i, o, and u*, are expressed by touching, with the fore-finger of the right hand, the thumb, or one of the fingers of the left, according to the letter required to be expressed.

A is made by touching the top of the thumb; *e*, by touching that of the fore-finger; *i*, by touching that of the middle finger; *o*, by touching that of the ring, or fourth finger; and *u*, by touching that of the little finger.

V. Join the fore-finger and thumb of each hand, and place the backs of the two fore-finger nails together.

C. Curve the fingers and thumb toward each other, so as to resemble as much as possible the shape of the letter.

D. Curve the fingers and thumb of the right hand, but not quite so much as for *C*, and place the tops of the fore-finger and thumb against the side of the fore-finger of the left hand, which is to be kept straight.

F. Place the fore-finger of one hand across the back of the two first fingers of the other.

G and J. Clench the hands, and place one fist upon the other.

H. Draw the palm of one hand across the palm and fingers of the other, beginning near the ball of the thumb, and going along the hands to the tips of the fingers, precisely as if you were brushing something off the palm of one hand with the other.

K. Curve the fore-finger toward the thumb, and place the second joint of the fore-finger so curved, against the back of the second joint of the fore-finger of the other hand.

L. Lay the fore-finger of the right hand straight upon the palm of the left.

M. Lay the three first fingers of the right hand upon the palm of the left.

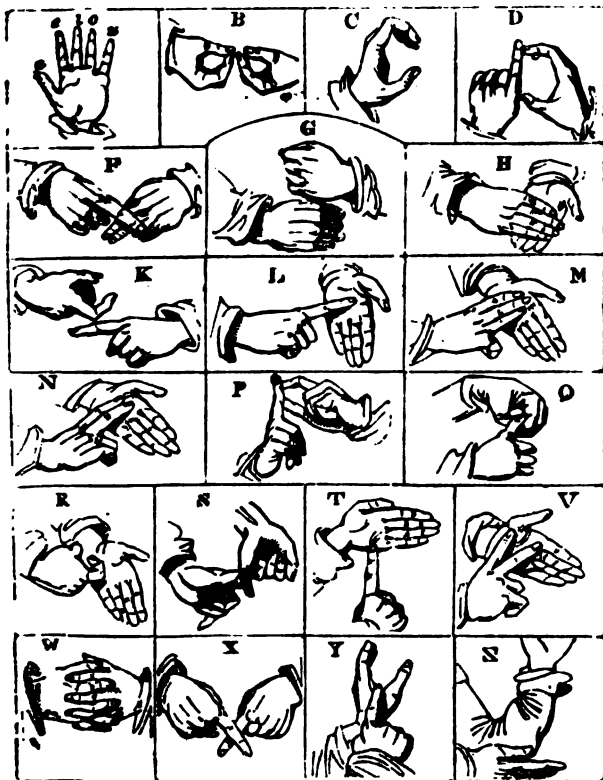
N. Lay the two first fingers of the right hand upon the palm of the left.

P. Bend the thumb and fore-finger as for *D*, only make a lesser curve, and place the tips of the thumb and fore-finger to the two first joints of the



THE DEAF AND DUMB ALPHABET

353





R. Curve the fore-finger of the right hand, and place it on the palm of the left.

S. Curve the little fingers of each hand, and hitch them together.

T Place the top of the fore-finger of the right hand against the lower edge of the left hand, between the little finger and the wrist.

V. This letter is made nearly as *N*, with this difference only, that for *V*, the two fore-fingers of the right hand are placed apart, upon the palm of the left, instead of close together, as is the case for *N*.

W. Join the hands, with the fingers of one between those of the other.

X. Cross the two fore-fingers at the second joint.

Y. Place the fore-finger of the right hand between the thumb and fore-finger of the left, which must both be extended.

Z. Raise one hand toward the face, and place the palm of the other under the elbow of the arm which is so elevated.

It is usual to mark the conclusion of each word by snapping the middle finger and thumb of the right hand: this, it may readily be imagined, renders the dumb language much more intelligible.

Numbers are counted by the fingers in the most simple way; one finger held up, signifies 1; two fingers, 2; the open hand, 5; the two hands, 10, &c.





BOY'S OWN BOOK.

INDEX.

- | | |
|----------------------------------|---------------------------------------|
| Accommodation, the triple, 215 | Balanced Stick, 156 |
| Accomplices, the four, 200 | Ball, the great wooden, 71 |
| Advance and Retreat, 290 | Ball, games with, 15 |
| Æolian Harp, 223 | Bandy Ball, 18 |
| Alphabet, Deaf and Dumb, 353 | Basket and stones, 107 |
| Amalgamation and Separation, 177 | Baste the Bear, 29 |
| Amusements, Arithmetical, 95 | Battledore and Shuttlecock, 37 |
| Amusements, Optical, 109 | Batsman, 52 |
| Amusements, Chemical, 125 | Bats and Balls, 52 |
| Anagram, Combinations of an, 107 | Beats on the blade, (in fencing,) 301 |
| Anagrams, 252 | Belt, Archer's, 46 |
| Anamorphosis, 123 | Bird in the Box, 160 |
| Angler, 263 | Blindman's Buff, 29 |
| Anglers, Rules for, 271 | Blue Bottle, 180 |
| Apparition, 119 | Bogle Bodkin, 161 |
| Appels, (in fencing,) 302 | Book, the Flying, 66 |
| Arch-board, game of, 11 | Boat-about, 9 |
| Archer's Position, 48 | Bottle lifted by a straw, 157 |



INDEX.

- Buck, game of, 37
- Butterflies, to take Impression of,
on paper, 224
- Butts, (in Archery,) 46
- Camera Lucida, 114
- Camera Obscura, 110
- Camera Obscura, Magnifying, 112
- Camera Obscura, Prismatic, 112
- Canary, Automaton, 193
- Cancelled figure, guessed, 105
- Candle ends, eatable, 153
- Candle invisibly extinguished, 136
- Candle of Ice, 180
- Candle lighted by smoke, 155
- Candle lighted by a glass of water,
187
- Card in a Cherry-stone, 203
- Card in the Mirror, 204
- Card in the Pocket-book, 206
- Card in the Egg, 202
- Card made to jump out of the pack,
190
- Card, marching, 205
- Card, noted, named, 198
- Card nailed to the wall, 201
- Card Puzzle, 219
- Card thought of, to tell blindfold,
196
- Cards, Tricks with, 105
- Century, Magical, 104
- Certain Game, 104
- Chair, to take from under you without
falling, 72
- Chairing the leg, 67
- Chameleon, Mineral, 162
- Charades, 232
- Chemical Samson, 187
- Cherry Cheat, 215
- Chess, 321
- Chinese Shadows, 121
- Chest Shooting, 49
- Coin, doubled, 158
- Colors, transmutation of, 124
- Combinations of an Anagram, 107
- Combustion and Explosion, 120
- Combustion in and under Water,
121
- Combustion by concentration of the
Sun's rays, 120
- Comical Cards, 220
- Confederate Signals, 205
- Confederate Water-drop, 220
- Conflagration, mimic, 179
- Conjuror's Joke, 155
- Conqueror, Game of, 10
- Cow-drums, 236
- Copying Machine, substitute for
226
- Cups and Bladders, 22



INDEX

- Deaf and dumb Alphabet, 353
 Deaf made to hear, 224
 Deception, simple, 165
 Demi-amputation, 170
 Dice guessed unseen, 105
 Dick, Duck, and Drake, 30
 Dinner party, 106
 Disarming, 304
 Disengaging, (in Fencing,) 294
 Disengagements in Octave and
 Semi-circle, 299
 Disengagements in Prime and
 Secunde, 299
 Diving, 90
 Dot and carry two, 66
 Double Dozen, 197
 Double Funnel, 171
 Dove-cote, 284
 Dragon, prancing, 161
 Draughts, 321
 Draughts, Games for practice in,
 325
 Draughts, Laws of, 324
 Draughts, Rules for playing, 322
 Drawing the Oven, Game of, 36
 Dropping the 'Kerchief, 87
 Duck, Game of, 35
 Dye, Wonderful, 175

 Eclipse Glass, 228
 Eels, 267
 Egg, travelling, 158
 Egg Box, 169
 Egg, sentinel, 158
 Egg, dancing, 180
 Egg in the Phial, 280
 Egg shells, engraving on, 229

 Extension, (in Fencing,) 292

 Faded Rose restored, 179
 Fascinated Bird, 166
 Feet to show, the, in swimming, 96
 Feints, 300
 Fencing, 289
 Finger-feat, 70
 Fingers, to step through your own,
 65
 Fire, Green, 132
 Fire, Green, under Water, 131
 Fire, Red, 132
 Fire, Yellow, 132
 Fire under Water, 152
 Fire and Wine Bottle, 171
 Fishing Rods, 264
 Fishing Lines, 264
 Fishing Hooks, 265
 Fives, Game of, 15
 Flight Shooting, 49
 Flight of the Ring, 170
 Floating Beacon, 154
 Floats, 265
 Flowers, various, to produce from
 one stem, 227
 Flute Player, 190
 Fly-fishing, natural, 268
 Fly-fishing, artificial, 269
 Flying Steps, 64
 Flying Book, 66
 Foils, 289
 Foil, how to hold the, 289
 Follow my Leader, 24
 Foot-Ball, 17
 Forcing a Card, 196
 Forty-five, the famous, 214



INDEX.

- Game of the Bag, 101**
Game of the Ring, 100
Game, the certain, 104
Games with Marbles, 9
Games with Balls, 15
Gas-factor, 138
Gas, Laughing, 229
Gathering of the Clans, 198
Geometrical Money, 212
Glass, to cut, 228
Glizades, 301
Globe Box, 172
Glove, Archer's, 45
Glow-worm in Gas, 136
Goblet, perilous, 155
Goff, Game of, 16
Grease-box Archer's, 46
Guards of Carte and Tierce, 290
Guinea Pigs, 281
Gymnastic Exercises, 59
Gymnastic Recreations, 65
Gymnastics, 57
- Half-crown upheld, 162**
Hand, to dip in water without wetting, 181
Handkerchief Hearth, 176
Handkerchief, mutilated, restored, 170
Harlequin Inks, 227
Hat Ball, 16
Hatched Bird, 172
- Horizontal Bar, 61**
Horse-dealer's bargain, 104
Humming-Top, 13
Hunt the Slipper, 35
Hydrometer, 225
Hydrometer, the awa of Barby, 225
- Ignition by compression, 186**
Ignition by percussion, 186
Illuminator and Extinguisher, 187
Illusions, singular, 124
Impossibility made possible, 213
Increase Pound, Game of, 12
Inks, Harlequin, 227
Inks, Sympathetic, 127
Invisible Girl, 191
- Javelin, 66**
Jumping, 60
Jumping Rope, 36
- Kaleidoscope, 141**
King of the Castle, 33
Kite, 26
Knock Out, Game of, 10
Knuckle down, 66
- Ladder to ascend, 64**
Lady, the slighted, 210
Lane Lamplighters, Game of, 34
Lane without flame, 136



INDEX

- Leg, chairing the, 67
 Leg or Slip, (in Cricket,) 53
 Leg-ardmain, 149
 Lifting at Arm's length, 70
 Lines, fishing, 264
 Little Gas-factor, 138
 Liquid produced from two Solids, 137
 Liquid, colorless, made of various colors without touching, 182
 Locked Jaw, 167
 Logogriphs, 258
 Long Field, off-side, (in Cricket,) 54
 Long Field, on-side, (in Cricket,) 54
 Long Leap, 62
 Long Pudding, 168
 Long Reach, 67
 Long Soup, (in Cricket,) 53
 Long Slip, (in Cricket,) 53
 Lop-eared Rabbit, 275
 Luminous Writing in the dark, 132

 Magic Lantern, 116
 Magic Lantern, to paint the glasses for, 117
 Magic Lantern, to exhibit 117
 Magic Lantern, nebulous, 119
 Magic Shrub, 136
 Magic Spoon, 178
 Magic Twelve, 190
 Magician Mahometan, 192
 Magnificent Crystals, 226
 Marbles, Games with, 9
 Marvellous Mirror, 122
 Mask of Flame, 186
 Mating Pigeons, 286

 Metallic vegetation, 133
 Metamorphosis, hideous, 177
 Microscope, solar, 121
 Middle Wicket to cover 53
 Milk rendered luminous 183
 Mineral Chameleon, 182
 Minor Sports, 7
 Mirror Marvellous, 122
 Mirror, Multiplying, 160
 Miscellaneous Sports, 29
 Money Box, 173
 Money Game, 100
 Money Geometrical, 212
 Mouse in the pack of Cards, 294
 Moving Pyramid, 157
 Multiplied Money, 124

 Nerve trick, 200
 Nine Holes, Game of, 16
 Northern Spell, 20
 Number thought of, to tell, 97, 98
 Number Nine, remarkable properties of, 102, 103
 Numbers, two or more thought of, to tell, 99

 Obedient Watch, 160
 Odd Score, 202
 Oil, to separate from water, 181
 Ombres Chinoises, 121
 Optical Amusements, 100
 Oyster Wager, 221

 Pack, the painted, 203
 Pall Mall, 36
 Palm-Spring, 69
 Paper Furnace, 157
 Paper, incombustible, 179



INDEX

- Parades of Octave and Semi-circle,** 291
Paradoxes and Puzzles, 297
Parallel Bars, 61
Pea-shooter, 26
Peg Top, 14
Perch, 267
Perpetual Motion, 179
Plantasmagoria, 120
Plantasmagoria, to make transparent screens for, 120
Philosophy cheated, 165
Phosphoric Fish, &c. 183
Phosphoric Oyster Shells, 185
Phosphoric Plants, 185
Phosphorus Steam Bath, 187
Phosphorescent Spar, 186
Phosphoric Wood, 184
Picture frames, made of paper, 224
Pigeon Lofts, 284
Pigeons, 288
Pigeons, feeding of, 285
Pigeons, diseases and remedies of, 286
Piquet pack, 197
Plank, to climb, 64
Plank for swimming, 85
Plaster Busts, &c., to bronze, 227
Point, (in Cricket) 53
Point, to cover, 53
Poised Penny, 152
Poker Puzzle, 72
Pole, perpendicular or slant, to ascend, 64
Polemoscope, 114
Poor-house Problem, 215
Pop-gun, 25
Protean Liquid, 179
Pulley, 72
Puss in the Corner, 23
Puzzle the Card, 219
Puzzle, Scale and Ring, 229
Puzzling Rings, 216
Pyramid, 12
Pyramid, moving, 157
Quaint Query, 212
Quiver, construction of, described, 46
Rabbitry and Hutches, 276
Rabbits, 273
Rabbits, Wild, 274
Rabbits, Domestic, 274
Rabbits, Lop-eared, 275
Rabbits, on feeding, 277
Rabbits, on breeding, 279
Rabbits, diseases of, 280
Rebuses, 246
Recreations, Gymnastic, 65
Regal Alliance, 202
Re-illumination, Wonderful, 156
Reprieve, partial, 214
Return on the Extension, 391
Ribbon, color of, removed and restored, 181
Riddler, 231
Ring Taw, Game of, 11
Ring suspended by a burnt thread, 156
Rings and Ribbons, 184
Rings, the Puzzling, 216
River on fire, in miniature, 186
Rods, fishing, 264



INDEX.

Roving, 46
Running, 60

Saddle my Nag, 23
Salamander, 174
Salts, crystallization of, 126
Salute, (in Fencing,) 296, 304
Sawson, chemical, 178
Seconde Thrust, (in Fencing,) 293
See-saw, 33
Sentinel Egg, 153
Seven in Two, 213
Sheep-fold, 212
Shilling, penetrative, 173
Short Slip, (in Cricket,) 53
Shrub, magic, 136
Shuffled Seven, 197
Silky's Cave, 181
Signals, confederate, 206
Silver Tree, 194
Sixpence, animated, 156
Skating, 139
Sliding, 30
Slighted Lady, 210
Sling, 25
Snow Statue, 38
Solar Microscope, 121
Solid produced from two Liquids,
187
Solutions to Enigmas, &c. 257
Sovereign and Sage, 106
Spans and Snaps, 9
Spoon, Magic, 178
Spoon, of Antimony, 81

Stone, wet, made to produce fire,
177
Stooping Stretch, 69
Storm and Calm, 156
Striker, (Cricket,) 52
Striking out, (in swimming,) 82
Sucker, 28
Swimming, 75
Swimming like a Dog, 88
Swimming on the side, 88
Swimming out of depth, 87
Swimming, to turn in, 90
Swimming, times and places for, 93
Swimming under water, 91
Swinging, 31
Sympathetic Inks, 127

Tantalus trick, 71
Taper, exploding, 186
Targets, 47
Tunnel, (in Archery,) 45
Tempest, to represent, 118
Thaumatrope, 27
Thread the Needle, 34
Thread, knotted, 159
Thread, restored, 168
Thread, incombustible, 177
Thrust of the Wrist, 301
Thrust, Time, 301
Thumb String, 154
Thumb, trial of the, 63
Tierce, 293
Tin Tree, 133
Tin, of, 81



INDEX.

- Treat, 206**
Tumble-down Dick, 70
Turn-over, (Gymnastics) 66
Turn over, (cards,) 202
Two to one, 70
- Ups and Downs, 201**
- Varieties, 223**
Vaulting, 63
Volcano, sub-aqueous, 178
- Wafers, wonderful, 63**
Walking, 60
Warning, Game of, 23
Watch, obedient, 169
Watch-spring Gun, 28
Water, agitated, to calm, 228
Water bewitched, 152
Water, entering the, 81
- Water 'o tread, 88**
Water, to heat, 90
**Water made to boil by cold, and
 cease to boil by heat, 137**
Well of Fire, 131
Whip Top, 13
Whoop, 34
Wicket, single, 55
Wicket-keeper, 53
Wickets, 52
Will o' the Wisp, 131
Wine Merchant and Clerk, 311
Wine upon Water, 155
Wizard's Chariot, 164
Wolf, Goat, and Cabbages, 214
Wooden Ball, the Great, 71
Wooden Bottle, Game of, 37
**Words, eighteen, in twenty-three
 Letters, 216**
Wowaki, a fancy Rabbit, 275







Transmutations.

	Page		Page
The Spectral Lamp	17	Wine changed into Water	26
Curious Change of Colours	18	Two colourless transparent Liquids	26
The Protean Light	18	become black and opaque	26
The Chameleon Flowers	19	Two colourless Fluids make a co-	26
To change the Colours of Flowers	19	loured one	26
Changes of the Poppy	19	Change of Colour by colourless	26
To change the Colour of a Rose	20	Fluids	26
Light changing White into Black	20	To change Blue Liquid to White	27
The visibly growing Acorn	20	Veritable "Black" Tea	27
Changes in Sap-Green	21	Restoration of Colour by Water	27
To revive apparently dead Plants	21	The Magic Writing	28
Singular effect of Tears	21	Two Liquids make a Solid	28
Beauties of Crystallization	21	Two Solids make a Liquid	28
To crystallize Camphor	23	A solid opaque Mass made a trans-	28



Sight and Sound

	Page		Page
Artificial Mirage	33	Apparatus for Writing in the Dark	48
Motion of the Eye	34	Portable Microscope	49
Single Vision with two Eyes	35	The Phenakisticope or Stoboscope	50
Two Objects seen as one	35	To look at the Sun without injury	51
Only one Object can be seen at a time	36	Brilliant Water Mirror	51
Straight Objects seen crooked	36	Optical Illusion under Water	51
Optical Illusion	37	The Magic Wheels	52
Pin-hole Focus	37	Acoustic Rainbow	53
Optical Deceptions	38	Transmission of Sound	53
Accuracy of Sight	38	Progress of Sound	55
Visual Deception	39	Sound turning Corners	55
Handwriting upon the Wall	39	To tell the Distance of Thunder	56
Imitative Haloes	39	Hearing by the Touch	56
To read a Coin in the Dark	40	Conversation for the Deaf	56
To make a Prism	40	Glass broken by the Voice	57
Optical Augmentation	41	Figures produced by Sound	57
Gold Fish in a glass Globe	42	Transmitted Vibration	58
Colours produced by the unequal Action of Light upon the Eyes	42	Double Vibration	58
Optical Deception	43	Champagne and Sound	58
Coloured Shadows	43	Music from Palisades	59
Colours of Scratches	43	Theory of the Jew's Harp	59
Ocular Spectra	44	Music of the Snail	60
Beautiful Colours of Mother of Pearl	44	To tune a Guitar without the assistance of the Ear	60
White Letters seen further than Black	45	Music from Glass or Metal Rods	61
Artificial Rainbow	45	The Tuning-fork a Flute-player	62
Fringe about a Candle	45	Musical Bottles	62
The Double Coloured Reflection	46	Theory of Whispering	62
Luminous Cross	46	Theory of the Voice	63
Ring of Colours round a Candle	46	Sound along a Wall	63
Simple and cheap Opera-glass	47	Sounds more audible by Night than by Day	63
Multiplying Theatres	47	Musical Echo	63
		Ventriloquism	64

Light and Heat.

Flashes of Light upon revolving Wheels	69	To colour the Flame of a Candle	73
Decomposition of Light	70	To divide the Flame of a Candle	73
Solar Refraction	70	Cane Wick Lamp	74
Incantations	71	Camphor and Platinum Lamp	74
To imitate the Light of the Sea	71	Platinum and Ether Lamp	74
Instantaneous Lights	72	Floating Light	75
		Substitute for a Wax Taper	75



CONTENTS.

11

	Page		Page
Phosphorescent Fish	75	Shadows made darker by increased	81
The Luminous Spectre	76	Light	81
Light, a Painter	76	Miniature Thunder and Lightning	82
Effect of Light upon Crystalliza-		The Burning Glass	82
tion	76	Magic of Heat	82
Effect of Light on Plants	76	Repulsion by Heat	83
Instantaneous Light upon Ice	77	Heat passing through Glass	84
White Light from Zinc	77	Metals unequally influenced by Heat	84
Brilliant Light from two Metals	77	Spontaneous Combustion	85
Brilliant Light from Steel	77	Inequality of Heat in Fire Irons	85
Lighted Tin	78	Expansion of Metal by Heat	85
Light from Gilt Buttons	78	Evaporation of a Metal	85
Light from a Flower	78	A Floating Metal on Fire	85
Light from Sugar	78	Heat and Cold from Flannel	85
Light from the Potato	79	Ice melted by Air	85
Light from the Oyster	79	To hold a hot Tea-kettle on the	
Light from Derbyshire Spar	79	Hand	85
Light from Oyster-shells	80	Incombustible Linen	87
Rings of Light in Crystal	80	The Burning Circle	87
To strike Light with Cane	80	Water of different Temperatures in	
Cause of Transparency	80	the same Vessel	87
Transparency of Gold	81	Warmth of different Colours	87
Tint changed by Thickness	81	Substitute for Fire	88

Gas and Steam.

Laughing Gas	91	Flame from Cold Metals	99
The Luminous Wand	92	Phosphorus in Chlorine	99
To make Carbonic Acid Gas	92	Caoutchouc Balloons	100
Carbonic Acid Gas in Wine or Beer		To increase the Light of Coal Gas	100
Vessels	92	Gas from Indian Rubber	100
To extinguish Flame with Gas	93	Ether Gas	101
Effect of Hydrogen on the Voice	93	Magic Vapour	101
Magic Taper	94	Gas from the union of Metals	101
The Gas Candle	94	Invisible Gases made Visible	102
Gas Bubbles	94	Light under Water	102
Gas-light in the Day-time	95	Gaseous Evanescence	102
Miniature Balloons	95	Violet-coloured Gas	102
Miniature Gas-lighting	95	To collect Gases	103
Musical Gas	95	The Deflagrating Spoon	103
Miniature Will-o'-the-wisp	97	What is Steam?	103
Phosphoric Illumination	97	The Steam Engine simplified	104
Combustion of Iron in Oxygen Gas	97	To boil Water by Steam	104
Glow-worm in Oxygen Gas	98	Distillation in Miniature	105
Luminous Charcoal	98	Candle or Fire Crackers	105
Brilliant Combustion in Oxygen	98	Steam from the Kettle	105



Fire, Water, and Air.

	Page		Page
Coloured Flames	109	Pyramid of Alum	120
Yellow Flame	110	Visible Vibration	121
Orange-coloured Flame	110	Charcoal in Sugar	122
Emerald Green Flame	110	Floating Needles	122
Instantaneous Flame	110	Water in a Sling	122
The Cup of Flame	111	Attraction in a Glass of Water	122
To cool Flame by Metal	111	To prevent Cork floating in Water	123
Proof that Flame is Hollow	111	Instantaneous Freezing	123
Camphor sublimed by Flame	111	To freeze Water with Ether	123
Green Fire	112	Production of Nitre	124
Brilliant Red Fire	112	Curious Transposition	124
Purple Fire	112	Animal Barometer	124
Silver Fire	112	Magic Soap	124
The Fiery Fountain	112	Equal Pressure of Water	125
The Artificial Conflagration	112	To empty a Glass under Water	125
Inflammable Powder	113	To empty a Glass of Water without touching it	125
Combustion without Flame	114	Decomposition of Water	126
Combustion of three Metals	114	Water heavier than Wine	126
To make Paper Incombustible	114	To inflate a Bladder without Air	126
Singular Experiments with Glass Tubes	114	Air and Water Balloon	126
Aquatic Bomb	115	Heated Air Balloon	127
Heat not to be estimated by Touch	115	The Pneumatic Tinder-box	127
Flame upon Water	116	The Bacchus Experiment	127
Rose-coloured Flame on Water	116	The Mysterious Circles	128
To set a Mixture on Fire with Water	116	Prince Rupert's Drops	130
Waves of Fire on Water	116	Vegetable Hygrometer	130
Explosion in Water	117	The Pneumatic Dancer	131
Water from the Flame of a Candle	117	The Ascending Snake	132
Formation of Water by Fire	117	The Pneumatic Phial	132
Boiling upon Cold Water	117	Resin Bubbles	133
Currents in Boiling Water	118	Moisture of the Atmosphere	133
Hot Water lighter than cold	118	Climates of a Room	133
Expansion of Water by Cold	118	Bubbles in Champagne	134
The Cup of Tantalus	119	Proofs that Air is a heavy Fluid	134
Imitative Diving Bell	119	To support a Tea on Air	135
The Water-proof Sieve	120	Pyrophorus, or Air-tinder	135
More than full	120	Beauty of a Soap-bubble	135
To cause Wine and Water to change Places	120	Why a Guinea falls more quickly than a Feather through the Air	137
		Solidity of Air	137
		Breathing and Smelling	138



CONTENTS.

19

Sleights and Subtleties.

	Page		Page
The Ring and the Handkerchief	143	Walnut-shell without injuring the Shell	157
The Knotted Handkerchief	144	The Magical Mirrors	158
The Invisible Springs	146	The Enchanted Bottle	159
The Miraculous Apple	147	The Armed Apparition	159
The Self-balanced Fall	148	To extract the Silver out of a Ring that is thickly gilded, so that the Gold may remain entire	160
The Phantom at command	148	Curious Experiment with a Glass of Water	160
The Miraculous Shilling	150	A Luminous Bottle, which will show the Hour on a Watch in the Dark	160
The Locomotive Shilling	151	The Wonderful Hat	161
The Penetrative Sixpence	152	To bring a Person down upon a Feather	161
The Vanishing Sixpence	153	The Apparent Impossibility of an Omelet cooked in a Hat over the Flame of a Candle	162
To make a Sixpence balance and spin on its Edge on the Point of a Needle	153	The Impossible Omelet	163
The Multiplying Coin	153	Go if you can	163
The Magic Rat Trap	153	The Figure Puzzle	163
The Velocity of Motion	154	The Visible Invisible	163
The Exploding Bubble	155	The Double Meaning	164
The Magic Picture	155	Quite tired out	164
Artificial Lightning	156	Something out of the Common	164
Three Objects discernible only with both Eyes	156	To rub one Sixpence into two	165
To tell by a Watch Dial the Hour when a Person intends to rise	156	Magic Circle	165
To make a Ring suspend by a Thread, after the Thread has been burned	157		
To melt a Piece of Money in a			

Melange.

Illusions of Touch	169	Colder than Ice	173
Illusion of the Taste	170	Contra-crystallization	173
The General Bleacher	170	One and one do not make two	174
Influence of coloured Glass on bulbous Roots	171	To copy Writing instantly	174
The Spinning-top "asleep"	171	The Rival Dials	174
To judge of Weights	172	To spin Indian Rubber	174
Quicksilver and Oil united	172	Indelible Writing	175
To dissolve the Soda in Glass	172	Vegetable Anatomy	175
Waterproof Paper	173	To tell what o'clock it is by the Moon	176
To dissolve Gold or Platinum	173	The Physiognotype	177



	Page		Page
Infinite Divisibility of Matter . . .	177	To break a Stone with a Blow of the Fist . . .	185
Holding the Breath . . .	178	Mimic Frost-work . . .	186
Sand in the Hour-glass . . .	178	To melt Lead in a Piece of Paper . . .	186
Resistance of Sand . . .	179	Hydraulic Balance . . .	186
Glass broken by Sand . . .	180	Metallic Reduction . . .	187
To bleach Ivory . . .	180	Electrical Attraction and Repulsion . . .	187
Vanishing Shells . . .	180	Alchemical Electricity . . .	188
The Magic Egg . . .	180	The Electric Balls . . .	188
The Magic Whirlpool . . .	181	The Electric Dances . . .	188
Magic Porcelain . . .	183	Electric Light . . .	188
A Galvanic Tongue . . .	184	Electric Light from Brown Paper . . .	189
Drinking Porter out of Pewter . . .	184	Sudden Production of Light . . .	189
Electric or Galvanic Preservation . . .	184	Electricity of the Cat . . .	189
Light from the Diamond . . .	185		





TRANSMUTATIONS.



THE SPECTRAL LAMP.

MIX some common salt with spirit of wine in a platinum or metallic cup; set the cup upon a wire frame over a spirit-lamp, which should be enclosed on each side, or in a dark lantern; when the cup becomes heated, and the spirit ignited, it will burn with a strong yellow flame; if, however, it should not be perfectly yellow, throw more salt into the cup. The lamp being thus prepared, all other lights should be extinguished, and the yellow lamp introduced, when an appalling change will be exhibited; all the objects in the room will be but of one colour; and the complex-



at his neighbour, himself insensible of being one of the spectral company.

Their astonishment may be heightened by removing the yellow light to one end of the room, and restoring the usual or white light at the other; when one side of each person's dress will resume its original colour, while the other will remain yellow; one cheek may bear the bloom of health, and the other the yellow of jaundice. Or if, when the yellow light only is burning, the white light be introduced within a wire sieve, the company and the objects in the apartment will appear yellow, mottled with white.

Red light may be produced by mixing with the spirit in the cup over the lamp, salt of strontium instead of common salt; and the effect of the white or yellow lights, if introduced through a sieve upon the red light, will be even more striking than the white upon the yellow light.

CURIOUS CHANGE OF COLOURS.

Let there be no other light than a taper in the room; then put on a pair of dark-green spectacles, and having closed one eye, view the taper with the other. Suddenly remove the spectacles, and the taper will assume a bright-red appearance; but, if the spectacles be instantly replaced, the eye will be unable to distinguish any thing for a second or two. The order of colours will, therefore, be as follows:—green, red, green, black.

THE PROTEAN LIGHT.

Soak a cotton wick in a strong solution of salt and water, dry it, place it in a spirit lamp, and, when lit, it will give a bright yellow light for a long time. If you look through a piece of blue



TRANSMUTATIONS.

19

glass at the flame, it will lose all its yellow light, and you will only perceive feeble violet rays. If, before the blue glass, you place a pale yellow glass, the lamp will be absolutely invisible, though a candle may be distinctly seen through the same glasses.

THE CHAMELEON FLOWERS.

Trim a spirit-lamp, add a little salt to the wick, and light it. Set near it a scarlet geranium, and the flower will appear yellow. Purple colours, in the same light, appear blue.

TO CHANGE THE COLOURS OF FLOWERS.

Hold over a lighted match, a purple columbine, or a blue larkspur, and it will change first to pink, and then to black. The yellow of other flowers, held as above, will continue unchanged. Thus, the purple tint will instantly disappear from a heart's-ease, but the yellow will remain; and the yellow of a wall-flower will continue the same, though the brown streak will be discharged. If a scarlet, crimson, or maroon dahlia be tried, the colour will change to yellow; a fact known to gardeners, who by this mode variegate their growing dahlias.

CHANGES OF THE POPPY.

Some flowers which are red, become blue by merely bruising them. Thus, if the petals of the common corn-poppy be rubbed upon white paper, they will stain it purple, which may be made



TO CHANGE THE COLOUR OF A ROSE.

Hold a red rose over the blue flame of a common match, and the colour will be discharged wherever the fume touches the leaves of the flower, so as to render it beautifully variegated, or entirely white. If it be then dipped into water, the redness, after a time, will be restored.

LIGHT CHANGING WHITE INTO BLACK.

Write upon linen with permanent ink, (which is a strong solution of nitrate of silver,) and the characters will be scarcely visible; remove the linen into a dark room, and they will not change; but expose them to a strong light, and they will be indelibly black.

THE VISIBLY GROWING ACORN.

Cut a circular piece of card to fit the top of a hyacinth glass, so as to rest upon the ledge, and exclude the air. Pierce a hole through the centre of the card, and pass through it a strong thread, having a small piece of wood tied to one end, which resting transversely on the card, prevents its being drawn through. To the other end of the thread attach an acorn; and, having half filled the glass with water, suspend the acorn at a short distance from the surface.



The glass must be kept in a warm room; and, in a few days, the steam which has generated in the glass will hang from the acorn in a large drop. Shortly afterwards, the acorn will burst, the root will protrude and thrust itself



TRANSMUTATIONS.

21

into the water; and, in a few days more, a stem will shoot out at the other end, and, rising upwards, will press against the card, in which an orifice must be made to allow it to pass through. From this stem, small leaves will soon be observed to sprout; and, in the course of a few weeks, you will have a handsome oak plant, several inches in height.

CHANGES IN SAP GREEN.

Sap green is the inspissated juice of the buckthorn berries: if a little carbonate of soda be dropped into it, the colour will be changed from green to yellow; it may be reddened by acids, and its green colour restored by chalk.

TO REVIVE APPARENTLY DEAD PLANTS.

Make a strong dilution of camphor in spirit of wine, which add to soft water, in the proportion of a drachm to a pint. If withered or apparently dead plants be put into this liquid, and allowed to remain therein from two to three hours, they will revive.

SINGULAR EFFECT OF TEARS.

If tears are dropped on a dry piece of paper, stained with the juice of the petals of mallows or violets, they will change the paper to a permanently green colour.

BEAUTIES OF CRYSTALLIZATION.

Dissolve alum in hot water until no more can be dissolved in it; place in it a smooth glass rod and a stick of the same size; next day, the stick will be found covered with crystals, but the glass rod will be free from them: in this case, the crystals cling to the rough surface of the stick, but have no hold upon the



smooth surface of the glass rod. But if the rod be roughened with a file at certain intervals, and then placed in the alum and water, the crystals will adhere to the rough surfaces, and leave the smooth bright and clear.

Tie some threads of lamp-cotton irregularly around a copper wire or glass rod; place it in a hot solution of blue vitriol, strong as above, and the threads will be covered with beautiful blue crystals, while the glass rod will be bare.

Bore a hole through a piece of coke, and suspend it by a string from a stick placed across a hot solution of alum; it will float; but, as it becomes loaded with crystals, it will sink in the solution according to the length of the string. Gas-coke has mostly a smooth, shining, and almost metallic surface, which the crystals will avoid, while they will cling only to the most irregular and porous parts.

If powdered turmeric be added to the hot solution of alum, the crystals will be of a bright yellow; litmus will cause them to be of a bright red; logwood will yield purple; and common writing ink, black; and the more muddy the solution, the finer will be the crystals.

To keep coloured alum crystals from breaking, or losing their colour, place them under a glass shade with a saucer of water; this will preserve the atmosphere moist, and prevent the crystals getting too dry.

If crystals be formed on wire, they will be liable to break off from the expansion and contraction of the wire by changes of temperature.



TRANSMUTATIONS.

23

TO CRYSTALLINE CAMPHOR.

Dissolve camphor in spirit of wine, moderately heated, until no spirit will not dissolve any more; pour some of the solution into a cold glass, and the camphor will instantly crystallize in beautiful tree-like forms, such as we see in the show-glasses of camphor in druggists' windows

CRYSTALLIZED TIN.

Mix half an ounce of nitric acid, six drachms of muriatic acid, and two ounces of water; pour the mixture upon a piece of tin plate previously made hot, and, after washing it in the mixture, it will bear a beautiful crystalline surface, in feathery forms. This is the celebrated *moirée métallique*, and, when varnished, is made into ornamental boxes, &c. The figures will vary according to the degree of heat previously given to the metal.

CRYSTALS IN HARD WATER.

Hold in a wine-glass of hard water, a crystal of oxalic acid, and white threads will instantly descend through the liquid, suspended from the crystal.

VARIETIES OF CRYSTALS.

Make distinct solutions of common salt, nitre, and alum; set them in three saucers in any warm place, and let part of the water dry away or evaporate; then remove them to a warm room. The particles of the salt in each saucer will begin to attract each other, and form crystals, but not all of the same figure: the common salt will yield crystals with six square and equal faces, or sides; the nitre, six-sided crystals; and the alum, eight-sided crystals; and if these crystals be dissolved over and over again, they will always appear in the same forms



HEAT FROM CRYSTALLIZATION.

Make a strong solution of Epsom salts in hot water, and while warm, bottle it, cork it closely, and it will remain liquid : draw out the cork, when the salts will immediately crystallize, and, in the process, the remaining liquid and the bottle will become very warm.

SPLENDID SUBLIMATION.

Put into a flask a small portion of iodine ; hold the flask over the flame of a spirit-lamp, and, from the state of rich ruby crystals, the iodine, on being heated, will become a ruby-coloured transparent gas ; but, in cooling, will resume its crystalline form

ARTIFICIAL ICE.

Mix four ounces of nitrate of ammonia, and four ounces of subcarbonate of soda with four ounces of water, in a tin vessel, and in three hours the mixture will produce ten ounces of ice

MAGIC INKS.

Dissolve oxide of cobalt in acetic acid, to which add a little nitre ; write with this solution ; hold the writing to the fire, and it will be of a pale rose colour, which will disappear on cooling.

Dissolve equal parts of sulphate of copper and muriate of ammonia in water ; write with the solution, and it will give a yellow colour when heated, which will disappear when cold.

Dissolve nitrate of bismuth in water ; write with the solution, and the characters will be invisible when dry, but will become legible on immersion in water



TRANSMUTATIONS.

25

Dissolve in water muriate of cobalt, which is of a bluish-green colour, and the solution will be pink; write with it, and the characters will be scarcely visible; but, if gently heated, they will appear in brilliant green, which will disappear as the paper cools.

CHAMELEON LIQUIDS.

Put a small portion of the compound called mineral chameleon into several glasses, pour upon each water at different temperatures, and the contents of each glass will exhibit a different shade of colour. A very hot solution will be of a beautiful green colour; a cold one, a deep purple.

Make a colourless solution of sulphate of copper; add to it a little ammonia, equally colourless, and the mixture will be of an intense blue colour; add to it a little sulphuric acid, and the blue colour will disappear; pour in a little solution of caustic ammonia, and the blue colour will be restored. Thus may the liquid be thrice changed at pleasure.

THE MAGIC DYES.

Dissolve indigo in diluted sulphuric acid, and add to it an equal quantity of solution of carbonate of potass. If a piece of white cloth be dipped in the mixture, it will be changed to blue; yellow cloth, in the same mixture, may be changed to green; red to purple, and blue litmus paper to red.

Nearly fill a wine-glass with the juice of beet-root, which is of a deep red colour; add a little lime water, and the mixture will be colourless; dip into it a piece of white cloth, dry it rapidly, and in a few hours the cloth will become red.

**WINE CHANGED INTO WATER.**

Mix a little solution of subacetate of lead with port wine, filter the mixture through blotting paper, and a colourless liquid will pass through; to this add a small quantity of dry salt of tartar, when a spirit will rise, which may be inflamed on the surface of the water.

**TWO COLOURLESS TRANSPARENT LIQUIDS BECOME BLACK
AND OPAQUE.**

Have in one vessel some sulphuric acid, and in another an infusion of nut-galls; they are both colourless and transparent: mix them, and they will become black and opaque.

TWO COLOURLESS FLUIDS MAKE A COLOURED ONE.

Put into a wine-glass of water, a few drops of prussiate of potash; and into a second glass of water, a little weak solution of sulphate of iron in water: pour the colourless mixtures together into a tumbler, and they will be immediately changed to a bright deep blue colour.

Or, mix the solution of prussiate of potash with that of nitrate of bismuth, and a yellow will be the product.



TRANSMUTATIONS.

87

drops of muriatic acid. The liquor in the first glass will assume a purple colour, the second a bright green, and the third a rich crimson.

Put a drachm of powdered nitrate of cobalt into a phial containing an ounce of the solution of caustic potass; cork the phial, and the liquid will assume a blue colour, next a lilac, afterwards a peach colour, and lastly a light red.

TO CHANGE A BLUE LIQUID TO WHITE.

Dissolve a small lump of indigo in sulphuric acid, by the aid of moderate heat, and you will obtain an intense blue colour: add a drop of this to half a pint of water, so as to dilute the blue; then pour some of it into strong chloride of lime, and the blue will be bleached with almost magical velocity.

VERITABLE "BLACK" TEA.

Make a cup of strong green tea; dissolve a little green copperas in water, which add to the tea, and its colour will be black.

RESTORATION OF COLOUR BY WATER.

Water being a colourless fluid, ought, one would imagine when mixed with other substances of no decided colour, to produce a colourless compound. Nevertheless, it is to water only that blue vitriol, or sulphate of copper, owes its vivid blueness; as will be plainly evinced by the following simple experiment. Heat a few crystals of the vitriol in a fire shovel, pulverize them, and the powder will be of a dull and dirty white appearance. Pour a little water upon this, when a slight hissing noise will be heard and at the same moment the blue colour will instantly reappear.

Under the microscope, the beauty of this experiment will be increased, for the instant that a drop of water is placed in contact



with the vitriol, the powder may be seen to shoot into blue prisms. If a crystal of prussiate of potash be similarly heated, its yellow colour will vanish, but reappear on being dropped into water.

THE MAGIC WRITING

Dissolve a small portion of green copperas in water, and soak in it sheets of writing paper, so as to allow them to be taken out whole, and then dried; then, cover the paper with very finely powdered galls, and write on it with a pen dipped in water; when dry, brush off the galls, and the writing will appear.

TWO LIQUIDS MAKE A SOLID.

Dissolve muriate of lime in water until it will dissolve no more; make also a similar solution of carbonate of potash; both will be transparent fluids; but if equal quantities of each be mixed and stirred together, they will become a solid mass.

TWO SOLIDS MAKE A LIQUID.

Rub together, in a mortar, equal quantities of the crystals of Glauber's salts and nitrate of ammonia, and the two salts will slowly become a liquid.

A SOLID OPAQUE MASS MADE A TRANSPARENT LIQUID.

Take the solid mixture of the solutions of muriate of lime and carbonate of potash, pour upon it a very little nitric acid, and the opaque mass will be changed to a transparent liquid.



TRANSMUTATIONS.

89

QUADRUPLE TRANSMUTATION.

Dissolve a small piece of nickel in nitric acid, and it will appear of a fine grass-green colour; add to it a little ammonia, and a blue precipitate will be formed; this will change to a purple-red in a few hours, and the addition of any acid will convert it to an apple-green.

QUINTUPLE TRANSMUTATION.

Heat potassium over the flame of a spirit-lamp, and the colour will change from white to a bright azure, thence to a bright blue, green, and olive.

COMBINATION OF COLOURS.

Cut out a disc or circle of pasteboard, and cover it with paper half green and half black; cause the disc to be rapidly turned round, (like the shafts of a toy windmill,) and the colours will combine and produce white.

UNION OF TWO METALS WITHOUT HEAT.

Cut a circular piece of gold-leaf, called "dentist's gold," about half an inch in diameter; drop upon it a globule of mercury about the size of a small pea, and if they be left for a short time,



TWO BITTERS MAKE A SWEET.

It has been discovered, that a mixture of nitrate of silver with aypo-sulphate of soda, both of which are remarkably bitter, will produce the sweetest known substance.

VISIBLE AND INVISIBLE.

Write with French chalk on a looking-glass ; wipe it with a handkerchief, and the lines will disappear ; breathe on it, and they will reappear. This alteration will take place for a great number of times, and after the lapse of a considerable period.





SIGHT AND SOUND.



ARTIFICIAL MIRAGE.



THE mirage is an optical phenomenon, produced by the refractive power of the atmosphere. The appearance presented is that of the double image of an object in the air; one of the images being in the natural position, and the other inverted, so as to resemble a natural object and its image in the water. The mirage is commonly vertical, or upright, that is, presenting the appearance, above described, of an object and its image in the water.



spirit or the syrup and water incorporate, they will produce a refractive power; then, by looking through the mixed or intermediate liquids at any object held behind the tumblers, its inverted image may be seen. The same effect, Dr. Wollaston has shown, may be produced by looking along the side of a red-hot poker at a word or object ten or twelve feet distant. At a distance less than three-eighths of an inch from the line of the poker, an inverted image was seen; and within and without that, an erect image.

The above phenomena may likewise be illustrated by holding a heated iron above a tumbler of water until the whole becomes changed; then withdraw the iron, and, through the water, the phenomena of the mirage may be seen in the finest manner.

Or, look directly above the flame of a candle, or over the glass of a lighted lamp, and a tremulous motion may be observed; because the warm air rises, and its refracting power being less than that of the colder air, the currents are rendered visible by the distortion of objects viewed through them. The same effect is observable over chimney pots, and slated roofs which have been heated by the sun.

MOTION OF THE EYE.



SINGLE VISION WITH TWO EYES.

As we have two eyes, and a separate image of every external object is formed in each, it may be asked, Why do we not see double? The answer is, It is a matter of habit. Habit alone teaches us that the sensations of sight correspond to any thing external, and shows to what they correspond. Thus, place a wafer on a table before you; direct your eyes to it, that is, bring its image on both retinæ to those parts which habit has ascertained to be the most sensible and best situated for seeing distinctly, and you will see only the *single wafer*. But, while looking at the wafer, squeeze the upper part of one eye downwards by pressing on the eyelid with the finger, and thereby forcibly throw the image on another part of the retina of that eye, and double vision will be immediately produced; that is, *two wafers* will be distinctly seen, which will appear to recede from each other as the pressure is stronger, and approach, and finally blend into one, as it is relieved. The same effect may be produced without pressure, by directing the eyes to a point nearer to or farther from them than the wafer; the optic axes, in this case, being both directed away from the object seen.

TWO OBJECTS SEEN AS ONE.

On a sheet of black paper, or other dark ground, place two white wafers, having their centres three inches distant. Vertically above the paper, and to the *left*, look with the *right* eye, at twelve inches from it, and so that, when looking down on it, the line joining the two eyes shall be parallel to that joining the



either to the right or left, above or below, it will become immediately visible, and start, as it were, into existence. The distances here set down may, perhaps, vary slightly in different eyes.

Upon this curious effect Sir John Herschel observes, "It will cease to be thought singular, that this fact of the absolute invisibility of objects in a certain point of the field of view of each eye, should be one of which not one person in ten thousand is apprized, when we learn that it is not extremely uncommon to find persons who have for some time been totally blind with one eye without being aware of the fact."

ONLY ONE OBJECT CAN BE SEEN AT A TIME.

Look at the pattern of the paper-hanging of a room, a picture, or almost any other object in it; then, without altering your position, call to mind the magnificent dome of St. Paul's Cathedral: the pattern of the paper-hanging, or the subject of the picture, though actually impressed on the retina of the eye, will be momentarily lost sight of by the mind; and, during the instant, the recollected image of the dome rising from the dingy roofs of London will be distinctly seen, but in indistinct colouring and



be of a curved form. The velocity of the wheel must not be so great as to prevent the eye from following the spokes as they revolve.

Again, when the disk of the wheel, instead of being marked by a number of radiant lines, has only one radius marked upon it, it presents the appearance, when rolled behind the bars, of a number of radii, each having the curvature corresponding to its situation, their number being the same as that of the bars through which you look at the wheel. It is, therefore, evident that the several portions of one and the same line, seen through the intervals of the bars, form on the retina of the eye so many different radii.

OPTICAL ILLUSION.

Shut one eye; direct the other to any fixed point, as the head of a pin, and you will indistinctly see all other objects. Suppose one of these to be a strip of white paper, or a pen lying upon a table covered with a green cloth: either of them will disappear altogether, as if taken off the table; for the impression of the green cloth will entirely extend itself over that part of the retina which the image of the pen occupied. The vanished pen will, however, shortly reappear, and again vanish; and the same effect will take place when both eyes are open, though not so readily as with one eye.



dark room, a white screen or sheet of paper be extended a few feet from a small round hole, an exact picture of all objects, of their natural colours and forms, will be seen on the screen; moving objects being represented in motion, stationary ones at rest.

OPTICAL DECEPTIONS.

Prick a hole in a card with a needle; place the same near the eye, in a line with the card-hole, look by day at the end of the needle, and it will appear to be behind and reversed.

Prick a hole with a pin in a black card, place it very near the eye, look through it at any small object, and it will appear as it is nearer the eye; while, if we observe it without the card, it will appear sensibly of the same magnitude at all par-
ticular distances.

ACCURACY OF SIGHT.

Rule a short line upon a slate, and upon another slate another line, one-eleventh longer than the first: a person possessing what is called "a true eye," may perceive the difference in length, even though fifty or sixty seconds elapse between looking at the first and the second lines. If they differ only one-twentieth, then an interval of thirty-five seconds may elapse without destroying the judgment; but if it be longer the judgment will be incorrect. When the difference between the lines is only to one-fiftieth, an interval of three seconds between the examination of each, is the longest that can be allowed without interfering with the correctness of the comparison.



SIGHT AND SOUND.

99

VISUAL DECEPTION.

Let a room be only lit by the feeble gleam of a fire, almost extinguished, and the eye will see with difficulty the objects in the apartment, from the small degree of light with which they happen to be illuminated. The more exertion is made to ascertain what these objects are, as by fixing the eye more steadily upon them, the greater will be the difficulty in accomplishing it. The eye will be painfully agitated, the object will swell and contract, and partly disappear, but will again become visible when the eye has recovered from its delirium

HANDWRITING UPON THE WALL.

Cut the word or words to be shown, out of a thick card or pasteboard, place it before a lighted lamp, and the writing will be distinctly seen upon the wall of the apartment.

IMITATIVE HALOES.

Look at a candle, or any other luminous body, through a plate of glass, covered with vapour, or dust in a finely divided state, and it will be surrounded with a ring of colours like a halo



the eye close behind the smooth side of the glass plate, look through it at a candle, and you will perceive three fine haloes at different distances, encircling the flame.

TO READ A COIN IN THE DARK.

By the following simple method, the legend or inscription upon a coin may be read in absolute darkness. Polish the surface of any silver coin as highly as possible; touch the raised parts with aqua-fortis, so as to make them rough, taking care that the parts not raised retain their polish. Place the coin thus prepared upon red-hot iron, remove it into a dark room, and the figure and inscription will become more luminous than the rest, and may be distinctly seen and read by the spectator. If the lower parts of the coin be roughened with the acid, and the raised parts be polished, the effect will be reversed, and the figure and inscription will appear dark, or black upon a light or white ground.

This experiment will be more surprising if made with an old coin, from which the figure and inscription have been obliterated; for, when the coin is placed upon the red-hot iron, the figure and inscription may be distinctly read upon a surface which had hitherto appeared black.

This experiment may be made with small coins upon a heated



SIGHT AND SOUND.

41

the glasses stuck to it, (Fig. 1.) The end view (Fig. 2) will show the angle, a , at which the pieces of glass meet; into which angle put a drop of water.

Fig. 1.



Fig. 2.

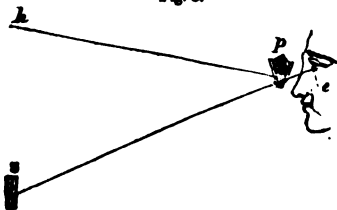


To use the instrument thus made, make a small hole, or a narrow

horizontal slit, so that you can see the sky through it, when you stand at some distance from it in the room. Or a piece of pasteboard placed in the upper part of the window-sash, with a slit cut in it, will serve the purpose of the hole in the shutter. The slit should be about one tenth of an inch wide, and an inch or two long, with even edges. Then hold the prism in your hand, place it close to your eye, and look through the drop of water, when you will see a beautiful train of colours, called a spectrum; at one end red, at the other violet, and in the middle yellowish green.

The annexed figure will better explain the direction in which

Fig. 3.



see the colours very bright and distinct.

to look: here, e , is the eye of the spectator; p , is the prism; h , the hole in the shutter or pasteboard; s , the spectrum. By a little practice, you will soon become accustomed to look in the right direction, and will



into which put a half-sovereign, and fill the glass three-fourths with water; place on it a piece of paper, and then a plate, and turn the glass upside down quickly, that the water may not escape: by looking sideways at the glass you will perceive a sovereign at the bottom, and higher up the half-sovereign, floating near the surface. Fill the glass with water, and the large piece only will be visible.

GOLD FISH IN A GLASS GLOBE.

A single gold fish in a globe vase is often mistaken for two fishes, because it is seen as well by the light bent through the upper surface of the water, as by straight rays passing through the side of the vase.

COLOURS PRODUCED BY THE UNEQUAL ACTION OF LIGHT UPON THE EYES.

If we hold a slip of white paper vertically, about a foot from the eye, and direct both eyes to an object at some distance beyond it, so as to see the slip of paper double, then, when a candle is brought near the right eye, so as to act strongly upon it, while the left eye is protected from its light, the left-hand slip of paper will be of a tolerably bright *green* colour, while the right-hand slip of paper, seen by the left eye, will be of a *red* colour. If the one image overlaps the other, the colour of the overlapping parts will be

**OPTICAL DECEPTION.**

Look steadily at a carpet having figures of one colour, green for example, upon a ground of another colour, suppose red, and you will sometimes see the whole of the green pattern, as if the red one were obliterated ; and at other times you will see the whole of the red pattern, as if the green one were obliterated. The former effect takes place when the eye is steadily fixed on the green part, and the latter when it is steadily fixed on the red portion.

COLOURED SHADOWS.

Provide two lighted candles, and place them upon a table before a whitewashed or light papered wall : hold before one of the candles a piece of coloured glass, taking care to remove to a greater distance the candle before which the coloured glass is not placed, in order to equalize the darkness of the two shadows. If you use a piece of green glass, one of the shadows will be green, and the other a fine red ; if you use blue glass, one of the shadows will be blue, and the other a pale yellow.

COLOURS OF SCRATCHES.

An extremely fine scratch on a well-polished surface may be regarded as having a concave, cylindrical, or, at least, a curved surface, capable of reflecting light in all directions ; this is evident, for it is visible in all directions. Hence, a single scratch or furrow in a surface may produce colours by the interference of the rays reflected from its opposite edges. Examine a spider's thread in the sunshine, and it will gleam with vivid colours. These may arise from a similar cause, or from the thread itself, as spun by the animal, consisting of several threads agglutinated together, and thus presenting, not a cylindrical, but a furrowed surface.



OCULAR SPECTRA.

One of the most curious affections of the eye is that in virtue of which it sees what are called *ocular spectra*, or accidental colours. If we place a red wafer on a sheet of white paper, and, closing one eye, keep the other directed for some time to the centre of the wafer, then, if we turn the same eye to another part of the paper, we shall see a green wafer, the colour of which will continue to grow fainter and fainter as we continue to look at it.

By using differently coloured wafers, we obtain the following results :

WAFER.	SPECIMEN.
Black	White.
White	Black.
Red	Bluish green.
Orange	Blue.
Yellow	Indigo.
Green	Violet, with a little Red.
Blue	Orange Red.
Indigo	Orange Yellow.
Violet	Bluish Green.

BEAUTIFUL COLOURS OF MOTHER-OF-PEARL.

This substance, obtained from the shell of the pearl oyster, is much admired for the fine play of its colours. To observe them accurately, select a plate of regularly-formed mother-of-pearl, with its surface nearly parallel, and grind this surface upon a hone, or upon a plate of glass with the powder of slate, till the image of the candle reflected from the surfaces is of a dull reddish white colour, when it will glow with all the colours of the rainbow. The



colours of mother-of-pearl may be communicated to soft black wax; and to clean surfaces of lead and tin, by hard pressure or the blow of a hammer. Or dissolve gum arabic or isinglass in water, and allow it to harden upon a surface of mother-of-pearl, when it will take a perfect impression from it, and exhibit all the colours in the finest manner. Or place the isinglass between two finely-polished surfaces of mother-of-pearl, and you may obtain a film of artificial mother-of-pearl, which, when seen by the light of a candle, or by an aperture in the window, will shine with the brightest hues.

WHITE LETTERS SEEN FARTHER THAN BLACK.

Paint the same letters of the same size precisely on two boards, the one white on a black ground, and the other a black on a white ground; the white letters will appear larger, and be read at a greater distance than the black.

ARTIFICIAL RAINBOW.

Observe the various colours which are reflected from the glass drops usually suspended from a lustre or chandelier, and you will witness a mimic rainbow. A rainbow may also be made by a garden engine, if the water be thrown high in the air, and the spectator stand between it and the sun.

FRINGE ABOUT A CANDLE.

Provide two small pieces of plate glass, moisten two of their sides with water, and put them together; then look through

**THE DOUBLE-COLOURED REFLECTION.**

Provide a circular piece of coloured glass, and pierce its centre by means of a common awl, well moistened with oil of turpentine. encircle the glass with the fingers and thumb, hold it in the sunshine or the strong light of a lamp, and the following beautiful effects will be produced. If the glass be red, the luminous spot in the centre will be reflected green; if the glass be green, the spot will be red; if blue, orange; and if yellow, indigo.

LUMINOUS CROSS.

Place a lighted candle before a looking-glass, and there will appear a luminous cross radiating from the flame of the candle. This is produced by the direction of the friction by which the glass is polished; the scratches placed in a horizontal direction, exhibiting the perpendicular part of the cross, and the vertical scratches the horizontal part.

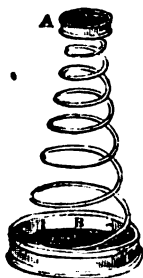
RINGS OF COLOURS ROUND A CANDLE.

Look at a candle through a plate of glass upon which you have gently breathed, or over which are scattered particles of dust, or any fine powder, and you will perceive the flame surrounded with beautiful rings of colours. By using the seed of the lycopodium, or by placing a drop of blood diluted with water between two pieces of glass, the rings of colour will be still more finely exhibited. Round the luminous body there will be seen a light area, terminating in a reddish dark margin; this will be succeeded by a ring of bluish-green, and then by a red ring; these two last colours succeeding each other several times when the particles are of uniform diameter, as are the seeds of the lycopodium, each of which is but the 850th part of an inch in diameter.



SIMPLE AND CHEAP OPERA-GLASS.

In this new instrument no tubes are necessary, as in the ordinary opera-glass; their place being supplied by a slender, elastic conical spring of wire, into the upper extremity of which is inserted the eye-glass; the object-glass being fixed to the other extremity, as shown in the engraving. The two glasses must, of course, be kept parallel to each other when in use; which is very easily effected.



In using this opera-glass, rest the finger and thumb of one hand on the rim of the object-glass, B, whilst, with the thumb and finger of the other hand you hold the rim of the eye-glass, A. The spring tube may then be drawn out or shut up to very minute distances. Thus, the ordinary sliding tubes are superseded; nor is any external covering necessary, as the hand in grasping the instrument serves the purpose. If, however, a covering be preferred, a piece of silk may be sewn to the spirals of the spring.

This kind of opera-glass may be made very cheaply. It may be shut into a small space for the pocket, merely by pressing the object-glass and the eye-glass together.

MULTIPLYING THEATRES.

Place two pieces of looking-glass, one at each end, parallel to one another, and looking over or by the edge of one of them, the images of any objects placed on the bottom of the box will appear

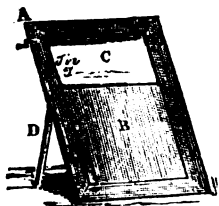


extent, there being no other limitation to the number of images but what is owing to the continued loss of light from reflection. The top of the box may be almost covered with thin canvass, which will admit sufficient light to render the exhibition very distinct.

The above experiments may be made very entertaining by placing on the bottom of the box some toy, as sentry soldiers, &c.; and, if these be put in motion, by wires attached to them, or passing through the bottom or side of the box, it will afford a still more entertaining spectacle. Or the bottom of the box may be covered with moss, shining pebbles, flowers, &c.; only, in all cases, the upright figures between the pieces of looking-glass should be slender and not too numerous, else they will obstruct the reflected light.

In a box with six, eight, or more sides, lined with looking glass, as above, the different objects in it will be multiplied to an almost indefinite extent.

APPARATUS FOR WRITING IN THE DARK



In this ingenious contrivance, A is a frame of wood, into the back and front of which are inserted two thin boards, the front one, B, reaching about half the height of the frame, and the back one being movable, by sliding in grooves, for better fixing the paper to be written on, C, to a roller at top, with a handle and ratchet working into a spring

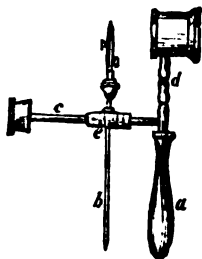
To use the apparatus, the paper is to be fixed on the roller, and a strip of lead, or other weight, suspended from the bottom of the paper, to keep it smooth: then, by resting the right hand



on the edge of the board B, and turning with the left hand the ratchet, the distance of the lines may be regulated by the number of clicks caused by the spring on the ratchet. D, is a foot to support the apparatus, which, however, should be light enough so to be held in the hand as a slate.

PORTABLE MICROSCOPE.

This cheap and useful instrument consists of a handle of hard wood, *a*, which is screwed into a brass piece, *d*, having at its top a ring, with screws on back and front, into which are to be screwed two cells with lenses of different foci. There is also a projecting piece formed on the side of the brass piece, *d*, in which is a hole to receive the screwed end of a cylindrical rod of brass, *c*. Upon this rod a springing slit socket, *e*, slides backwards and forwards, and is also capable of being turned round. This socket has affixed to it, on one side, a projecting part, with a screwed cavity in it, to receive a short screwed tube, with a small hole in its centre, made to fit the steel stem of the spring forceps; a corresponding hole being





This microscope possesses three different magnifying powers, namely, those of two lenses separately, and the two in combination.

Microscopes of a still simpler nature are small globules of glass, formed by smelting the ends of fine threads of glass in the flame of a candle; and small globular microscopes of great magnifying power, made of hollow glass about the size of a small walnut, may be purchased very cheaply at the opticians'.

THE PHENAKISTICOPE, OR STOBOSCOPE.

This amusing instrument consists of a turning wheel, upon which figures are seen to walk, jump, pump water, &c. The disc or wheel should be of stout card-board, upon which should be painted, towards the edge, figures in eight or ten postures. Thus, if it is wished to represent a man bowing, the first position is a man standing upright; in the second, his body has a slight inclination; in the third, still more; and so on, to the sixth position, where the body is most bent: the four following represent the figure recovering its erect posture; so that the fifth and seventh, the fourth and eighth, the third and ninth, and second and tenth figures have the same posture. Between each of the figures on the wheel should be a slit, three-fourths of an inch long and one-fourth of an inch wide, in a direction parallel with the radii of the wheel, and extending to an equal distance from the centre.

To work this instrument, place the figured side of the wheel before a looking-glass, and cause it to revolve upon its centre; then look through the slits or apertures, and you may observe, in the glass, the figures bowing continually, and with a rapidity proportionate to the rate at which the wheel turns. The illusion depends on the circumstance that the wheel between each aper-



ture is covered, while the figure goes further. That the deception may be complete, it is necessary that every part of the figures not bowing shall be at an equal distance from the centre of the wheel and from the slits; also that the figures possess equal thickness and colour.

TO LOOK AT THE SUN WITHOUT INJURY.

Provide a wine-glass filled with plain water, which will keep off the heat so effectually that the brightest sun may be viewed some time through it without any inconvenience. If a little black ink be added to the water, the image of the sun will appear through it as white as snow; and when the ink is still more diluted, the sun will be of a purple hue.

BRILLIANT WATER MIRROR.

Nearly fill a glass tumbler with water, and hold it, with your back to the window, above the level of the eye, as in the engraving. Then look obliquely, as in the direction E, *a*, *c*, and you will see the whole surface shining like burnished silver, with a strong metallic reflection; and any object, as a spoon, A C B, immersed in the water, will have its immersed part, C B, reflected on the surface, as in a mirror, but with a brilliancy far sur-





coins invisible; then let another person pour water gently in, and as it rises in the gallipot, it will cause both the sixpence and shilling to be seen, without your approaching nearer to the gallipot, or moving it towards you.

THE MAGIC WHEELS.

Cut out two card-board cog-wheels of equal size; place them upon a pin, and whirl them round with equal velocity in opposite directions; when, instead of producing a hazy tint, as one wheel would do, or as the two would if revolving in the same direction, there will be an extraordinary appearance of a fixed wheel. If the cogs be cut slantwise on both wheels, the spectral wheel, as it may be called, will exhibit slanting cogs; but if one of the wheels be turned so that the cogs shall point in opposite directions, then the spectral wheel will have straight cogs. If wheels with radii, or arms, be viewed when moving, the deception will be similar and however fast the wheels may move, provided it be with equal velocity, the magic of a fixed wheel will be presented.

Or, cut a card-board wheel with a certain number of teeth or cogs at its edge; a little nearer the centre cut a series of apertures resembling the cogs in arrangement, but not to the same number; and still nearer the centre cut another series of apertures, different in number and varying from the former. Fix this wheel upon another, with its face held two or three yards



SIGHT AND SOUND.

53

These amusing deceptions were first experimented by Mr Faraday. The simple apparatus for their exhibition may be purchased, for a trifling sum, of any respectable optician.

ACOUSTIC RAINBOW.

A sounding-plate, made of brass, nine inches long, and half a line in thickness, covered with a layer of water, may be employed to produce a rainbow in a chamber which admits the sun. On drawing a violin bow strongly across the plate, so as to produce the greatest possible intensity of tone, numerous drops of water fly perpendicularly and laterally upwards. The size of the drops is smaller as the tone is higher. The inner and outer rainbows are very beautifully seen in these ascending and descending drops, when the artificial shower is held opposite to the sun. When the eyes are close to the falling drops, each eye sees its appropriate rainbow; and four rainbows are perceived at the same time, particularly if the floor of the room is of a dark colour. The experiment succeeds best, if, when a finger is placed under the middle of the plate, and both of the angular points at one side are supported, the tone is produced at a point of the opposite side, a fourth of its length from one of its angles. An abundant shower of drops is thus obtained.

TRANSMISSION OF SOUND.



sensible of the impression of any sound conveyed through the mouth, the teeth, or the head : if you put one end of a small stick or rod in the mouth, and touch with the other extremity a watch lying on the table, the beatings will become quite audible, though the ears be actually shut. So, also, if a log of wood be scratched at one end with a pin, a person who applies his ear to the other end will hear the sound distinctly.

Fogs and falling rain, but especially snow, powerfully obstruct the free propagation of sound ; and the same effect is produced by a coating of fresh-fallen snow on the ground, though when glazed and hardened at the surface by freezing, it has no such influence.

Over water, or a surface of ice, sound is propagated with remarkable clearness and strength. Dr. Hutton relates, that on a quiet part of the Thames, near Chelsea, he could hear a person distinctly at 140 feet distance, while on the land the same could only be heard at 76 feet. Lieutenant Forster, in the third polar expedition of Captain Parry, held a conversation with a man across the harbour of Port Bowen, a distance of 6696 feet, or about a mile and a quarter. This, however remarkable, falls short of what is related by Dr. Young, on the authority of the



SIGHT AND SOUND.

55

PROGRESS OF SOUND.

A stretched string, as that of a piano-forte, may be made to vibrate not only from end to end, but in aliquot parts, the portions being separated by points of rest which interrupted the progress of the sound. This kind of effect may be shown by shaking a long piece of cane in the air, when there will be one, two, or three points of rest, according to the mode of vibrating it.

An elastic surface has, likewise, some parts in motion and others at rest; and these parts may be made visibly distinct, by strewing pieces of bristle over them upon the sounding-board of an instrument.

When a bow is drawn across the strings of a violin, the impulses produced may be rendered evident by fixing a small steel bead upon the bow; when looked at by light or in sunshine, the bead will seem to form a series of dots during the passage of the bow.

SOUND TURNING CORNERS.

Take a common tuning-fork, strike it, and hold it (when set in vibration) about three or four inches from the ear, with the flat side towards it, when the sound will be distinctly heard; let a strip of card, somewhat longer than the flat of the tuning-fork, be inter-



Even where there is no obstacle in the way, sounds are by no means equally audible in all directions from the sounding body, as you may ascertain by holding a vibrating tuning-fork or pipe near your ear, and turning it quickly on its axis.

TO TELL THE DISTANCE OF THUNDER.

Count, by means of a watch, the number of seconds that elapses between seeing the flash of lightning and hearing the report of the thunder; allow somewhat more than five seconds for a mile, and the distance may be ascertained. Thus, say the number of seconds is

$$\frac{5 \times 20}{4} \text{ miles distant;}$$

or the distance may be estimated by remarking the number of beats of the pulse in the above interval; provided, of course, that we know the rate at which the pulse beats in a certain time. In a French work, it is stated that if the pulse beat six times, the distance of the thunder will be about 30,000 feet, or five miles and a half; thus reckoning 5000 feet for each pulsation.

In a violent thunder-storm, when the sound instantly succeeds the flash, the persons who witness the circumstance are in some danger: when the interval is a quarter of a minute, they are secure

HEARING BY THE TOUCH.

If a deaf person merely place the tips of his finger-nails on the window-shutters or door of a room in which instruments are playing, he may enjoy their concert of harmony.



SIGHT AND SOUND.

57

resting their teeth against them. The person who speaks may rest the stick against his throat or his breast; or he may rest the stick, which he holds in his teeth, against a glass tumbler or china basin, into which the other speaks. The sound may also be heard when a thread is held between the teeth by both persons, so as to be somewhat stretched.

GLASS BROKEN BY THE VOICE.

On vibrating bodies, which present a large surface, the effects of sounds are very surprising. Persons with a clear and powerful voice have been known to break a drinking-glass by singing the proper fundamental note of their voice close to it. Looking-glasses are also said to have been broken by music, the vibrations of the atoms of the glass being so great as to strain them beyond the limits of their cohesion.

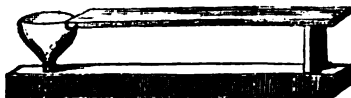
FIGURES PRODUCED BY SOUND.

Stretch a sheet of wet paper over the mouth of a glass tumbler which has a footstalk, and glue or paste the paper at the edges. When the paper is dry, strew dry sand thinly upon its surface.



TRANSMITTED VIBRATION.

Provide a long, flat glass ruler or rod, as in the engraving, and cement it with mastic to the edge of a drinking-glass fixed into a wooden stand; support the other end of the rod very lightly on a



piece of cork, and strew its upper surface with sand; set the glass in vibration by a bow, at a

point opposite where the rod meets it, and the motions will be communicated to the rod without any change in their direction. If the apparatus be inverted, and sand be strewed on the under side of the rod, the figures will be seen to correspond with those produced on the upper surface.

DOUBLE VIBRATION.

Provide two discs of metal or glass, precisely of the same dimensions, and a glass or metal rod; cement the two discs at their centres to the two ends of the rod, as in the engraving, and strew their upper surfaces with sand. Cause one of the discs, viz. the upper one, to vibrate by a bow, and its vibration will be exactly imitated





SIGHT AND SOUND.

59

edges, and will emit only a disagreeable and puffy sound. Nor will the glass ring while the wine is brisk and filled with air-bubbles; but as the effervescence subsides the sound will become clearer and clearer, and when the air bubbles have entirely disappeared, the glass will ring as usual. If a crumb of bread be thrown into the champagne, and effervescence be reproduced, the glass will again cease to ring. The same experiment will also succeed with soda water, ginger wine, or any other effervescing liquid.

MUSIC FROM PALISADES. .

If a line of broad palisades, set edgewise in a line direct from the ear, and at even distances from each other, be struck at the end nearest the auditor, they will reflect the sound of the blow, and produce a succession of echoes: these, from the equal distance of the palisades, will reach the ear at equal intervals of time, and will, therefore, produce the effect of a number of impulses originating in one point. Thus a musical note will be heard.

THEORY OF THE JEWS-HARP.

If you cause the tongue of this little instrument to vibrate, it will produce a very low sound; but if you place it before a cavity (as the mouth) containing a column of air, which vibrates much



A proof of this fact has been given by Mr. Eulenstein, who fitted into a long metallic tube a piston, which, being moved could be made to lengthen or shorten the efficient column of air within at pleasure. A Jews-harp was then so fixed that it could be made to vibrate before the mouth of the tube, and it was found that the column of air produced a series of sounds, according as it was lengthened or shortened; a sound being produced whenever the length of the column was such that its vibrations were a multiple of those of the Jews-harp.

MUSIC OF THE SNAIL.

Place a garden-snail upon a pane of glass, and in drawing itself along, it will frequently produce sounds similar to those of musical glasses.

TO TUNE A GUITAR WITHOUT THE ASSISTANCE OF THE EAR.

Make one string to sound, and its vibrations will, with much force, be transferred to the next string: this transference may be seen by placing a saddle of paper, like an inverted ∇ , (Δ), upon the string, at first in a state of rest. When this string *hears* the other, the saddle will be shaken, or fall off; when both strings are in harmony, the paper will be very little or not at all shaken.

MUSIC FROM GLASS OR METAL RODS.

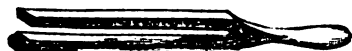


than in the case of a column of air of the same length, as in a flute. The reason of this is the greater velocity with which sound is propagated in solids than in the air. If the rod be metal, the friction will be found to succeed best when made with a bit of cloth, sprinkled with powdered resin; or, if of glass, the cloth or the finger may be moistened and touched with some very fine sand or pumice powder.

Generally speaking, a fiddle-bow, well resined, is the readiest and most convenient means of setting solid bodies in vibration. To bring out their gravest or fundamental tones, the bow must be pressed hard and drawn slowly; but, for the higher harmonies, a short, swift stroke, with light pressure, is most proper.

THE TUNING-FORK A FLUTE-PLAYER.

Take a common tuning-fork, and on one of its branches fasten with sealing-wax a circular piece of card, of the size of a small



wafer, or sufficient nearly to cover the aperture of a pipe, as the sliding of the

upper end of a flute with the mouth stopped; it may be tuned in unison with the loaded tuning-fork (a C fork) by means of the movable stopper or card, or the fork may be loaded till the unison is perfect. Then set the fork in vibration by a blow on the unloaded branch, and hold the card closely over the mouth of the pipe, as in the engraving, when a note of surprising clearness and strength will be heard. Indeed, a flute may be made to "speak" perfectly well, by holding close to the opening a vibrating tuning-fork, while the fingering proper to the note of the fork is at the same time performed.



MUSICAL BOTTLES

Provide two glass bottles, and tune them by pouring water into them, so that each corresponds to the sound of a different tuning-fork. Then apply both tuning-forks to the mouth of each bottle alternately, when that sound only will be heard, in each case, which is reciprocated by the unisonant bottle, or, in other words, by that bottle which contains a column of air susceptible of vibrating in unison with the fork.

THEORY OF WHISPERING.

Apartments of a circular or elliptical form are best calculated for the exhibition of this phenomenon. If a person stand near the wall, with his face turned to it, and whisper a few words, they may be more distinctly heard at nearly the opposite side of the apartment, than if the listener were situated nearer to the speaker.

THEORY OF THE VOICE.

Provide a species of whistle, common as a child's toy or a sportsman's call, in the form of a hollow cylinder, about three-fourths of an inch in diameter, closed at both ends by flat circular plates, with holes in their centres. Hold this toy between the teeth and lips; blow through it, and you may produce sounds varying in pitch with the force with which you blow. If the air be cautiously graduated, all the sounds within the compass of a



SIGHT AND SOUND.

69

have been distinctly pronounced the words, *mamma, papa, mother, father, summer*. This instrument consists of a pair of bellows, to which is adapted a tube terminating in a bell, the aperture of which is regulated by the hand, so as to produce the articulate sounds.

SOUND ALONG A WALL.

Whisper along the bare wall of an apartment, and you will be heard much further than in the middle of the room ; for the trough or angle between the wall and the floor, forms two sides of a square pipe which conveys the sound.

SOUNDS MORE AUDIBLE BY NIGHT THAN BY DAY.

The experiment with the glass of champagne (page 56) has been employed by Humboldt, in explanation of the greater audibility of distant sounds by night than by day. This he attributes to the uniformity of temperature in the atmosphere by night, when currents of air no longer rise and disturb its equilibrium ; as the air-bubbles in the champagne interfere with the vibration within the glass. Again, the universal and dead silence generally prevalent at night, renders our auditory nerves sensible to sounds which would otherwise escape them, and which are inaudible among the continual hum of noises which is always going on in the day time.

MUSICAL ECHO.

If a noise be made in a narrow passage. or apartment of



VENTRILLOQUISM.

The main secret of this surprising art simply consists in first making a strong and deep inspiration, by which a considerable quantity of air is introduced into the lungs, to be afterwards acted upon by the flexible powers of the larynx, or cavity situated behind the tongue, and the trachea, or windpipe; thus prepared, the expiration should be slow and gradual. Any person, by practice, can, therefore, obtain more or less expertness in this exercise: in which, though not apparently, the voice is still modified by the mouth and tongue; and it is in the concealment of this aid, that much of the perfection of ventriloquism lies.

But the distinctive character of ventriloquism consists in its imitations being performed by the voice *seeming* to come from the stomach: hence its name, from *venter*, the stomach, and *loquor*, to speak. Although the voice does not actually come from that region, in order to enable the ventriloquist to utter sounds from the larynx without moving the muscles of his face, he strengthens them by a powerful action of the abdominal muscles. Hence, he speaks by means of his stomach; although the throat is the real source from whence the sound proceeds. It should, however, be added, that this speaking distinctly, without any movement of the lips at all, is the highest perfection of ventriloquism, and has but rarely been attained. Thus, MM. St. Gille and Louis Brabant, two celebrated French ventriloquists, appeared to be absolutely mute while exercising their art, and no change in their countenances could be discovered.

It has lately been shown, that some ventriloquists have acquired by practice the power of exercising the veil of the palate in such a manner, that, by raising or depressing it, they dilate or contract the inner nostrils. If they are closely contracted, the sound pro



duced is weak, dull, and seems to be more or less distant; if, on the contrary, these cavities are widely dilated, the sound will be strengthened, the voice become loud, and apparently close to us.

Another of the secrets of ventriloquism is the uncertainty with respect to the direction of sounds. Thus, if we place a man and a child in the same angle of uncertainty, and the man speaks with the accent of a child, without any corresponding motion in his mouth or face, we shall necessarily believe that the voice comes from the child. In this case, the belief is so strengthened by the imagination; for if we were directed to a statue, as the source from which we were to expect sounds to issue, we should still be deceived, and refer the sounds to the lifeless stone or marble. This illusion will be greatly assisted by the voice being totally different in tone and character from that of the man from whom it really comes. Thus, we see how easy is the deception when the sounds are required to proceed from any given object, and are such as they actually yield.

The ventriloquists of our time, as M. Alexander and M. Fitz-James, have carried their art still further. They have not only spoken by the muscles of the throat and the abdomen, without moving those of the face, but have so far overcome the uncertainty of sound as to become acquainted with modifications of



Vocal imitations are much less striking and ingenious than the feats of ventriloquism. Extraordinary varieties of voice may be produced, by speaking with a more acute or grave pitch than usual, and by different contractions of the mouth. Thus may be imitated the grinding of cutlery on a wheel, the sawing of wood, the frying of a pancake, the uncorking of a bottle, and the gurgling noise in emptying its contents.





LIGHT AND HEAT.



FLASHES OF LIGHT UPON REVOLVING WHEELS.

PROVIDE a circle of card-board, six inches in diameter; divide it into sixteen parts, and paint them alternately red and black. Provide a second circle or disc of the same size, and paint on it, in large characters, the words "At rest," on a white ground. Connect both discs with the simple apparatus for causing them to turn round, used in the construction of a toy windmill. Next fill a basin with water, and provide a few small pieces of phosphuret of lime: darken the room, hold the discs over the basin, and turn them



seem joined into one, to the exclusion of the intervening red, and *vice versa* : the words on the second disc will also cross each other in various directions, when the flashes of light interfere ; and in both cases confusion will be excited by an impression being made on the retina before preceding impressions have departed.

DECOMPOSITION OF LIGHT.

Sir Isaac Newton first divided a white ray of light, and found it to consist of an assemblage of coloured rays, which formed an image upon a wall, and in which were displayed the following colours : red, orange, yellow, green, blue, indigo, and violet. Sir Isaac then showed that these seven colours, when again put together or combined, recomposed white light. This may be proved by painting a card wheel in circles with the above colours, and whirling it rapidly upon a pin, when it will appear white.

Light may also be decomposed by the following beautiful experiment : Form a tube about ten inches long and one inch in diameter, of paper, one side of which is of a bright blue colour. This may be done by wrapping the paper once round a cylinder of wood, and securing the edges of the paper with paste. The coloured side of the paper must be the interior of the tube. Apply this tube to one eye, the other being closed, and on looking at the ceiling, a circular orange spot will be seen, which is the result of decomposition : the white light from the ceiling enters the tube, the blue is retained, and the red and yellow rays enter the eye, and produce the impression of orange.



LIGHT AND HEAT.

71

vessel be filled, you may withdraw to any distance from which the surface of the water will be visible, and, by the refraction from it, you can still observe the shilling.

INCANTATIONS.

Dissolve crystals of nitrate of copper in spirit of wine; light the solution, and it will burn with a beautiful emerald-green flame: pieces of sponge soaked in this spirit, lighted and suspended by fine wires, produce the lambent green flames now so common in incantation scenes: strips of flannel saturated with it, and applied round copper swords, tridents, &c., produce, when lighted, the flaming swords and fire-forks brandished by the demons in such scenes: indeed, the chief consumption of nitrate of copper is for these purposes.

TO IMITATE THE LIGHT OF THE SEA.

It is well known, that on dark, stormy nights, the sea emits a brilliant light, the effect of which may be thus imitated: Scrape off four drachms of the substance of putrefying fish, as whiting, herring, or mackerel, and put it into a white glass bottle, containing two ounces of sea-water, or of pure water with two drachms of common salt dissolved in it; set the bottle in a dark place, and in three days a ring of light will be seen on the surface of the liquid, and the whole, if shaken, will become luminous, and continue so for some time. If it be set in a warm place, the



alkaline leys, as pearl-ash or soda and water, will permanently extinguish this spontaneous light.

INSTANTANEOUS LIGHTS.

The oxygenated or *chlorate matches* are first dipped in melted sulphur, and then tipped with a paste made of chlorate of potass, sulphur, and sugar, mixed with gum-water, and coloured with vermilion: frankincense and camphor are sometimes mixed with the composition, and the wood of the match is pencil-cedar, so that a fragrant odour is diffused from the matches in burning. To obtain light, a match is very lightly dipped in a bottle containing a little asbestos soaked in oil of vitriol.

Lucifers consist of chips of wood tipped with a paste of chlorate of potass mixed with sulphuret of antimony, starch, and gum water: when a match is pinched between the folds of glass paper and suddenly drawn out, a light is instantly obtained.

Prometheans consist of small rolls of waxed paper, in one end of which is a minute quantity of vitriol, in a glass bulb, sealed up, and surrounded with chlorate of potass: when the end thus prepared is pressed so as to break the bulb, the vitriol comes in contact with the composition, and produces light instantly.

**TO COLOUR THE FLAME OF A CANDLE.**

Take a piece of packthread, or cotton thread; boil it in clean water to free it from saline particles, and dry it; wet one end, and take upon it a little of either of the salts hereafter named, in fine powder or strong solution. Then dip the wetted end of the thread into the cup of a burning wax candle, and apply it to the exterior of the flame, not quite touching the luminous part, but so as to be immersed in the cone of invisible but intensely heated air which envelopes it. Immediately, an irregular sputtering combustion of the wax on the thread will take place, and the invisible cone of heat will be rendered luminous, with a peculiarly coloured light, according to the salt employed.

Thus, common salt will give a bright yellow; muriate of potass will give a beautiful pale violet; muriate of lime will give a brick red; muriate of strontia will give a magnificent crimson; muriate of lithia will give a red; muriate of baryta will give a fine pale apple green; muriate of copper will give a beautiful bluish green; and green copperas will give a white light.

TO DIVIDE THE FLAME OF A CANDLE.

Provide about a foot square of brass or iron wire gauze, of the fineness of thirty meshes to the square inch: lower the gauze near the flame of a wax candle, which will not rise through the



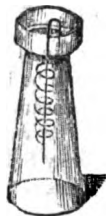
To vary this experiment, place a chip of camphor in the centre of a piece of wire gauze about a foot square, and hold it over the flame of a candle or lamp; when the vapour of the camphor will burn brightly upon the lower surface of the gauze, but cannot rise through it in consequence of its cooling power. Thus, the camphor lies upon the gauze in an uninflamed state, though it is sufficiently heated to yield inflammable vapour to feed a flame beneath.

CANE WICK LAMP.

Cut a piece of cane about one inch long; set it upright in spirit of wine, with a small portion just above the surface: the spirit will then rise through the tube of the cane, which being lighted, will burn as a wick.

CAMPBOR AND PLATINUM LAMP.

Place a small piece of camphor, or a few fragments, upon the bottom of a glass, and lay upon the camphor a piece of coiled or pressed up platinum wire, heated in the flame of a lamp; when the platinum will glow brilliantly as long as any camphor remains, and frequently light up into a flame.



PLATINUM AND ETHER LAMP.

Put into a small hyacinth-glass a teaspoonful of ether, and suspend in it, by wire, a coil of fine platinum wire, first heated in the flame of a spirit-lamp; the wire will then glow with a red heat, and some of it may become white-hot; in the latter case, flame will be produced by the ether burning.



LIGHT AND HEAT.

75

FLUORESCING LIGHT.

Cut a chip of camphor; light it, and set it on a basin of water, when it will continue to burn and float until it is consumed.

SUBSTITUTE FOR A WAX TAPER.

Steep a loosely twisted cotton skein in a solution of nitre; dry it, and it will readily kindle by the sparks produced from the flint and steel. If, however, the cotton be further prepared by coating portions of it, at regular intervals, alternately with sulphur and white wax, and the sparks be struck upon the sulphur, it will readily kindle, and as readily light the wax; and the flame will endure long enough for sealing a letter.

PHOSPHORESCENT FISH.

Place a very stale fish in a dark room, and it will give out a strong light, because of the numerous animalcules whose growth the putrefaction has promoted.

THE LUMINOUS SPECTRE.

When a substance is heated, it emits a light of a certain color, which is called its luminous spectrum.

**LIGHT, A PAINTER.**

Strain a piece of paper or linen upon a wooden frame, and sponge it over with a solution of nitrate of silver in water; place it behind a painting upon glass, or a stained window-pane, and the light, traversing the painting or figures, will produce a copy of it upon the prepared paper or linen; those parts in which the rays were least intercepted being the shadows of the picture.

EFFECT OF LIGHT UPON CRYSTALLIZATION.

Place a solution of nitre in a small basin of water, in a room which has the light admitted only through a small hole in the window-shutter; crystals will then form most abundantly upon the side of the basin exposed to the aperture through which the light enters; and often the whole mass of crystals will turn towards it. This peculiar effect may also be seen in the crystals in camphor glaases in druggists' windows, which are always most copious upon the side exposed to the light.

EFFECT OF LIGHT ON PLANTS.

Shut a plant up in a room into which light is only admitted through a small hole in the window-shutter, and set the plant out of the direction of this light; it will in a short time turn itself, and even grow downwards, that it may expose its leaves to the light.

If plants be kept in darkness, they will soon become bleached; then, if they be exposed to the sun, for three, four, or five hours, the leaves and stalks will become as intensely green as if the plants had been reared in the sun. Again, if a lighted lamp be introduced into a dark room, wherein a plant has been shut up



LIGHT AND HEAT.

77

and bleached, it will become green, and direct itself towards the lamp. If such a plant be removed from the room, exposed for some time to the sun, and then returned to darkness, it will no longer support the privation of light, but will fade and perish.

INSTANTANEOUS LIGHT UPON ICE.

Throw upon ice a small piece of potassium, and it will burst into flame. In one experiment, the operator pressed the potassium on the ice with a penknife, when the whole length of the ice became ignited.

WHITE LIGHT FROM ZINC.

As a substance for light, zinc is far superior to any of the metals. The light which it yields on burning is as bright as that of the sun, and as white, so that the eye can scarcely endure it; and the effect is much increased by the great quantity of silvery smoke which reflects the fire, and thus widely increases the sphere of illumination. Zinc may be used in thin sheets, or in filings.

BRILLIANT LIGHT FROM TWO METALS.

Wrap a small piece of platinum in a piece of tin-foil of the same size, and expose them upon charcoal to the action of the flame; when the union of the two metals will be seen

**LIGHTED TIN.**

Place upon a piece of tinfoil a few powdered crystals of nitrate of copper; moisten it with water; fold up the foil gently, and wrap it in paper so as to keep out the air; lay it upon a plate and the tin will soon inflame.

LIGHT FROM GILT BUTTONS.

Provide a new and highly-polished gilt button, and hold it in a strong light, closely but obliquely, over a sheet of white paper, when it will present radiations exactly like the spokes of a carriage wheel; the radiations being sixteen in number, and a little contracted in the centre opposite the eye of the button, and presenting altogether a beautiful appearance.

LIGHT FROM A FLOWER.

Hold a lighted candle to the flower of the *fraxinella*, and it will dart forth little flashes of light. This beautiful appearance is caused by the essential and inflammable oil contained in small vessels at the extremities of the flower, which vessels burn at the approach of any inflamed body, setting at liberty the essential oil, as that contained in orange-peel is discharged by pressure.

LIGHT FROM SUGAR.

Simply break a bit of lump sugar between the fingers in the dark, and light will be produced at the moment of fracture.

Or, if powdered loaf sugar be put into a spoon, fused, and kindled in the flame of a lamp, it will exhibit a fine jet of flame.



LIGHT AND HEAT.

79

LIGHT FROM THE POTATO.

Place a few potatoes in a dark cellar, and when they become in a state of putrefaction, they will give out a vivid light sufficient to read by. A few years since, an officer on guard at Strasbourg thought the barracks were on fire, in consequence of the light thus emitted from a cellar full of putrefying potatoes.

LIGHT FROM THE OYSTER.

Open an oyster, retain the liquor in the lower or deep shell, and if viewed through a microscope, it will be found to contain multitudes of small oysters, covered with shells, and swimming nimbly about; one hundred and twenty of which in a row would extend but one inch. Besides these young oysters, the liquor contains a variety of animalcules, and myriads of three distinct species of worms, which shine in the dark like glow-worms. Sometimes their light resembles a bluish star about the centre of the shell, which will be beautifully luminous in a dark room.

LIGHT FROM DERBYSHIRE SPAR.

Pound, coarsely, some of the dark blue or the fetid variety of Derbyshire spar; heat it in a dark room, in a platinum spoon, over the low flame of a spirit-lamp, and the spar will shine with a beautiful purple tint.



rescent light, increasing as the temperature is raised. The light augments when the spar is plunged into water; and in boiling water, the spar becomes so luminous that the letters of a printed book can be seen in a dark room near the glass containing it.

Another variety of fluor spar, also found in Siberia, is of a pale violet colour, and emits a white light merely by the heat of the hand; and when put into boiling water, it will give out a green light.

LIGHT FROM OYSTER SHELLS.

Put oyster-shells into a common fire; burn them for about half an hour; then remove them into a dark room, when many of the shells will exhibit beautiful specimens of prismatic colours.

RINGS OF LIGHT IN CRYSTAL.

This is one of the most striking of optical exhibitions, and may be thus simply produced: Provide a sheet of clear ice, about an inch thick, frozen in still weather; let the light fall through the ice upon a pane of window-glass, or a polished table, and by placing a fragment of plate-glass near the eye as a reflector, the most beautiful rings of light may be observed.

TO STRIKE LIGHT WITH CANE.



LIGHT AND HEAT.

61

piece of dry paper has its pores obstructed with finely interwoven threads; these are broken by the liquor, which also fills the pores as so many small tubes, and permits the light to pass through it; whereas the dry threads had hitherto prevented its passage.

TRANSPARENCY OF GOLD.

All bodies are more or less transparent. Thus, though gold is one of the densest metals, yet, if a piece of the thinnest gold leaf be held up to a candle, the light will pass through it; and, that it passes through the substance of the metal, and not through cracks or holes too small to be detected by the eye, is evident from the colour of the transmitted light, which is green.

TINT CHANGED BY THICKNESS.

Provide a piece of plain and polished smalt-blue glass, such as sugar-basins and finger-glasses are made of. It should be of unequal thickness. Look through this glass at a strong light, as that from the crack of a window-shutter, in a darkened room, and, at the thinnest part, the colour will be purely blue. As the thickness increases, a purple tinge will come on, which will become more and more ruddy; and, if the glass be very thick, the colour will pass to a deep red.

SHADOWS MADE DARKER BY INCREASED LIGHT.



88

LIGHT AND HEAT.

MINIATURE THUNDER AND LIGHTNING.

To imitate thunder, provide a thin sheet of iron; hold it by one corner between the finger and thumb, and allow it to hang freely by its own weight. Then shake the hand horizontally, so as to agitate the corner in a direction at right angles to the surface of the sheet. Thus you may produce a great variety of sounds, from the deep growl of distant thunder to those loud claps which rattle in rapid succession immediately over our heads. The same effect may be produced by sheets of tinned iron or tin-plate, and by thin plates of mica; but the sound is shorter and more acute.

Partial flashes of lightning, aurora borealis, &c. may be beautifully imitated by taking in a spoon about a dram of the seeds of lycopodium, and throwing them against a lighted candle, all other light being excluded from the room.

A similar effect may be produced, by laying some powdered resin on a piece of paper, and flapping it with the finger against the flame of a candle.

THE BURNING GLASS.

If, when the sun shines brightly, a piece of paper be held in the focus of the rays drawn by the burning-glass, it will take fire. This experiment succeeds best with brown or any dark-coloured paper: for, though the glass will collect an equal number of rays upon white as upon coloured paper, the white paper reflects the rays instead of allowing them to enter it; hence the white is not so soon burnt as the coloured paper, which, absorbing more light than it reflects, soon becomes heated and takes fire.

MAGIC OF HEAT.

Melt a small quantity of the sulphate of potass and copper in a spoon over a spirit-lamp; it will be fused at a heat just below



redness, and produce a liquid of a dark-green colour. Remove the spoon from the flame, when the liquid will become a solid of a brilliant emerald-green colour, and so remain till its heat sinks nearly to that of boiling water, when suddenly a commotion will take place throughout the mass, beginning from the surface, and each atom, as if animated, will start up and separate itself from the rest, till, in a few moments, the whole will become a heap of powder.

REPULSION BY HEAT.

Provide two small pieces of glass; sprinkle a minute portion of sulphur upon one piece, lay thin strips of wood around it, and place upon it the other piece of glass. Move them slowly over the flame of a lamp or candle, and the sulphur will become sublimed, and form grey nebulous patches, which are very curious microscopic objects. Each cluster consists of thousands of transparent globules, imitating, in miniature, the nebulae which we see figured in treatises on astronomy. By observing the largest particles, we shall find them to be flattened on one side. Being very transparent, each of them acts the part of a little lens, and forms in its focus the image of a distant light, which can be perceived even in the smaller globules, until it vanishes from minuteness. If they are examined again after a certain number of hours, the smaller



glass. The flattened form of the particles is owing to the force with which they endeavour to recede from the lower glass, and their consequent pressure against the surface of the upper one. This experiment is considered by its originator, Mr. H. F. Talbot, F. R. S. to be a satisfactory argument in favour of the repulsive power of heat.

HEAT PASSING THROUGH GLASS.

The following experiment is also by Mr. Talbot:—Heat a poker bright-red hot, and having opened a window, apply the poker quickly very near to the outside of a pane, and the hand to the inside; a strong heat will be felt at the instant, which will cease as soon as the poker is withdrawn, and may be again renewed, and made to cease as quickly as before. Now, it is well known, that if a piece of glass is so much warmed as to convey the impression of heat to the hand, it will retain some part of that heat for a minute or more; but, in this experiment, the heat will vanish in a moment. It will not, therefore, be the heated pane of glass that we shall feel, but heat which has come through the glass, in a free or radiant state.

METALS UNEQUALLY INFLUENCED BY HEAT.

All metals do not conduct heat at the same rate, as may be proved by holding in the flame of a candle at the same time, a piece of silver wire, and a piece of platina wire, when the silver wire will become too hot to hold, much sooner than the platina. Or, cut a cone of each wire, tip it with wax, and place it upon a heated plate, (as a fire shovel,) when the wax will melt at different periods.



LIGHT AND HEAT.

85

SPONTANEOUS COMBUSTION.

Mix a little chlorate of potass with spirit of wine in a strong saucer; add a little sulphuric acid, and an orange vapour will arise and burst into flame.

INEQUALITY OF HEAT IN FIRE-IRONS.

Place before a brisk fire a set of polished fire-irons, and besides them a rough unpolished poker, such as is used in a kitchen, or instead of a bright poker. The polished irons will remain for a long time without becoming warmer than the temperature of the room, because the heat radiated from the fire is all reflected, or thrown off, by the polished surface of the irons, and none of it is absorbed. The rough poker will, however, become speedily hot, so as not to be used without inconvenience. Hence, the polish of fire-irons is not merely ornamental but useful.

EXPANSION OF METAL BY HEAT.

Provide an iron rod, and fit it exactly into a metal ring; heat the rod red-hot, and it will no longer enter the ring.

Observe an iron gate on a warm day, when it will shut with difficulty; whereas, it will shut loosely and easily on a cold day

EVAPORATION OF A METAL.



its usual lustre: if, however, the mercury be left for some time on the spoon, the solid texture of the silver will be destroyed throughout, and then the silver can only be recovered by heating it in a ladle.

A FLOATING METAL ON FIRE.

Throw a small piece of that marvellous substance potassium into a basin of water, and it will swim upon the surface, and burn with a beautiful light, of a red colour mixed with violet. When moderately heated in the air, potassium takes fire, and burns with a red light.

HEAT AND COLD FROM FLANNEL.

Put a piece of ice into a basin, which wrap up in many folds of flannel, and the ice may be preserved for some time by the fireside.

ICE MELTED BY AIR.

If two pieces of ice be placed in a warm room, one of them may be made to melt much sooner than the other, by blowing on it with a pair of bellows.

TO HOLD A HOT TEA-KETTLE ON THE HAND.

Be sure that the bottom of the kettle is well covered with soot;



LIGHT AND HEAT.

87

INCOMBUSTIBLE LINEN.

Make a strong solution of borax in water, and steep in it linen, muslin, or any article of clothing; when dry, they cannot easily be inflamed.

THE BURNING CIRCLE.

Light a stick, and whirl it round with a rapid motion, when its burning end will produce a complete circle of light, although that end can only be in one part of the circle at the same instant. This is caused by the duration of the impression of light upon the retina. Another example is, that during the twinkling of the eye we never lose sight of the object we are viewing.

WATER OF DIFFERENT TEMPERATURES IN THE SAME VESSEL.

Of heat and cold, as of wit and madness, it may be said that "thin partitions do their bounds divide." Thus, paint one-half of the surface of a tin-pot with a mixture of lamp-black and size, and leave the other half, or side, bright; fill the vessel with boiling water, and by dipping a thermometer, or even the finger, into it shortly after, it will be found to cool much more rapidly upon the blackened than upon the bright side of the pot.

WARMTH OF DIFFERENT COLOURS.

Place upon the surface of snow, as upon the window-sill, in bright daylight or sunshine, pieces of cloth of the same size and quality, but of different colours, black, blue, green, yellow, and white: the black cloth will soon melt the snow beneath it, and sink downwards; next the blue, and then the green; the yellow but slightly; but the snow beneath the white cloth will be as firm as at first.

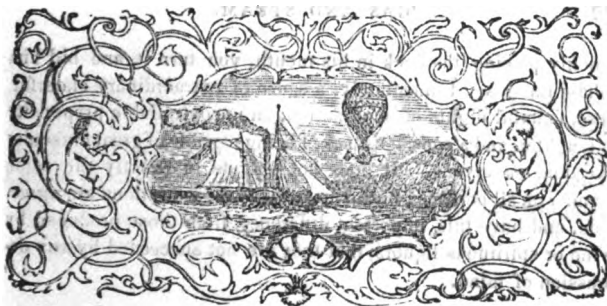


SUBSTITUTE FOR FIRE.

Put into a cup a lump of quick-lime, fresh from the kiln, pour water upon it, and the heat will be very great. A pailful of quick-lime, if dipped in water, and shut closely into a box constructed for the purpose, will give out sufficient heat to warm a room, even in very cold weather.



Out of The People of the World



GAS AND STEAM.



LAUGHING GAS. N_2O

THE above fanciful appellation has been given to nitrous oxide, from the very agreeable sensations excited by inhaling it. In its pure state it destroys animal life, but loses this noxious quality when inhaled, because it becomes blended with the atmospheric air which it meets in the lungs. This gas is made by putting three or four drachms of nitrate of ammonia, in crystals, into a small glass retort, which being held over a spirit-lamp, the crystals will melt, and the gas be evolved.

Having thus produced the gas, it is to be passed into a large bladder having a stop-cock; and when you are desirous of exhibiting its effects, you cause the person who wishes to experience them, first to exhale the atmospheric air from the lungs, and then



quickly placing the cock in his mouth, you turn it, and bid him inhale the gas. Immediately, a sense of extraordinary cheerfulness, fanciful flights of imagination, an uncontrollable propensity to laughter, and a consciousness of being capable of great muscular exertion, supervene. It does not operate in exactly the same manner on all persons; but in most cases the sensations are agreeable, and have this important difference from those produced by wine or spirituous liquors, that they are not succeeded by any depression of mind.

THE LUMINOUS WAND.

Cover a long slip of wood, halfway, with sulphur, by immersion while in a melted state. Having prepared a jar of nitrous oxide gas, as in preceding experiment, light the sulphur, and plunge the wand into the jar. The gas will extinguish the flame. Withdraw the wand, light it again, and when the flame is very brilliant, immerse it again in the jar. It will this time burn with great splendour, and of a beautiful red colour.

TO MAKE CARBONIC ACID GAS.

Put about an ounce of marble in small lumps, into an eight ounce phial, with about an equal quantity of water; pour in a little muriatic acid, and carbonic acid gas will be evolved.

CARBONIC ACID GAS IN WINE OR BEER VESSELS.

The apparently empty or upper part of vessels in which wine or beer is working, is filled with this deleterious gas; for its great weight prevents its ascent from the fermenting liquid. A variety of striking but simple experiments may be made with the



GAS AND STEAM.

93

gas in this condition. Lighted paper, or a candle dipped into it, will be immediately extinguished; and the smoke remaining in the carbonic acid gas will render its surface visible, which may be thrown into waves by agitation, like water. In consequence of the great weight of the carbonic acid gas, it may be taken from a vat of fermenting liquor, in a jug or bottle, and in the latter, if well corked, it may be conveyed to great distances; or the gas may be drawn out of a vessel by a cock, like a liquid.

TO EXTINGUISH FLAME WITH GAS.

The effects produced by pouring carbonic acid gas from one vessel to another, have a very singular appearance: if a lighted candle be placed in a jar, and the gas be poured upon it, the flame will be extinguished in a few seconds, though the eye is incapable of distinguishing that any thing is poured out.

EFFECT OF HYDROGEN ON THE VOICE.

Make a hole through a wine cork of sufficient size to admit a smaller cork; through which make another hole, and fix it into



MAGIC TAPER.

Provide a piece of copper wire, about ten inches long, and fix at one end of it a piece of wax taper: take a pint bottle of hydrogen, and place the mouth downwards; light the taper, introduce it into the bottle, and the gas will take fire, and burn slowly towards the mouth, where it is in contact with the air. If, however, the taper be passed up into the bottle, it will be extinguished; but, on gently withdrawing it through the burning hydrogen, the wick will be rekindled. This may be done several times in succession with the same portion of gas.

THE GAS CANDLE.



Provide a strong glass bottle which will contain about eight ounces, or half a pint, into which put a few pieces of zinc; then mix half an ounce of sulphuric acid with four ounces of water, and pour it into the bottle upon the zinc; fit the mouth closely with a cork through which put a metal tube which ends upward in a fine opening: the mixture in the bottle will soon effervesce, and hydrogen gas will rise through the tube. When it has escaped for about a minute, apply a lighted paper to the tube, and the gas will burn like a candle, but with a pale flame. Its brightness



GAS AND STEAM.

95

By pressing the bladder, soap-bubbles will be formed, filled with hydrogen gas; which bubbles, or balloons, will rise in the air, and keep there for some time.

GAS-LIGHT IN THE DAY-TIME.

Light a stream of hydrogen gas, and it will be scarcely visible in the daylight; but place in it a small coil of platinum wire, or project a little oxide of zinc through the flame, and it will become very luminous.

MINIATURE BALLOONS.

One of the simplest and most beautiful experiments in aërostation, is to take a turkey's maw, or stomach, properly prepared, and to fill it either with pure hydrogen gas, or the carburetted hydrogen produced from coal. If the balloon be then allowed to escape in the open air, it will ascend rapidly in the atmosphere: but the best method of showing the experiment, is to let the balloon off a high staircase, and observe it ascend to the cupola or light, where it will remain near the highest point till the escape of the gas allow it to descend. The prepared maw for this balloon may be purchased of any optician.

MINIATURE GAS-LIGHTING.



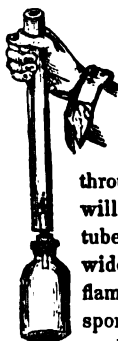
to the orifice of the tube, when the gas will burn with a bright white light, very different from that afforded by the combustion of hydrogen; a circumstance owing to the presence of particles of carbon in the carburet, which being intensely ignited are highly luminous.

It is no less strange than true, that bicarburetted hydrogen, the substance which we so largely consume to illuminate our towns, is ether when united to water in one proportion, and spirit when combined with it in another; a fluid which constitutes the strength of all wines, beer and fermented liquors.

MUSICAL GAS.

Hydrogen

Into a half-pint glass bottle, put some zinc, granulated by being melted in a ladle, and then poured gradually into water. Add some sulphuric acid, diluted with eight parts by weight of water. Then pass a glass tube with a capillary bore through a cork, which you have previously made to closely fit the bottle, and cork the bottle well. In a short time the atmospheric air will be expelled, and hydrogen gas will rise through the tube; you then apply a light, and the gas will become ignited. If you now hold another glass tube, about eighteen or twenty inches long and sufficiently wide to enclose the other tube very loosely, over the flame, (*see engraving*,) the little speck of flame will sport along the larger tube, and musical sounds will be produced, which may be varied by using other tubes of different dimensions, and made of different materials; the wide tubes forming the lower, and the narrow tubes the upper notes.





GAS AND STEAM.

97

MINIATURE WILL-O'-THE-WISP.

Put a small piece or two of the phosphuret of lime into a saucer of water, when bubbles of phosphuretted hydrogen gas will rise to the surface, explode into flame, and cause a white smoke; representing, on a small scale, the *ignis fatuus*, or will-o'-the-wisp, as seen over marshy ground, or stagnant pools of water.

PHOSPHORIC ILLUMINATION.

A light so brilliant that the eye can scarcely bear to contemplate it, is produced by the immersion of phosphorus in oxygen gas. To perform this experiment, you place a piece of phosphorus in a copper cup, of the circumference of a sixpence, which is fastened to a thick piece of iron wire, attached to a cork which fits a bottle (as in the foregoing experiment) filled with oxygen gas. Set fire to the phosphorus, and quickly plunge it into the bottle; when the splendour of the combustion will be surpassingly beautiful.

It is necessary to observe, that the heat is so excessive, that if the piece of phosphorus in this experiment be larger than a small pea, there will be great danger of breaking the bottle.

COMBUSTION OF IRON IN OXYGEN GAS.

Twist a piece of fine iron wire, such as is used by piano-forte makers, round a cylindrically-shaped piece of wood or metal, which will give it a spiral form; or a broken watch-spring, which may be bought for a trifle of the watchmakers, will answer the same



the bottle. Do not cork the bottle, but let the cork merely lie on the mouth, and to prevent its being burned, a small piece of lead should be fastened to the bottom of it. The iron will instantly begin to burn with great brilliancy, throwing out luminous scintillations.

To prevent the bottle from being broken by the sparks, a small quantity of sand should be previously poured into it.

GLOWWORM IN OXYGEN GAS.

If a glowworm be placed in a jar of oxygen gas, in a dark room, it will shine with a brilliancy far surpassing that which it exhibits in atmospheric air.

LUMINOUS CHARCOAL.

Attach a small piece of charcoal to the end of a copper wire, make it red-hot, and immerse it in a jar of oxygen gas. The charcoal will burn with great brilliance, throwing out splendid scintillations. The bark of the wood converted into charcoal must be selected, otherwise there will be no scintillations.

BRILLIANT COMBUSTION IN OXYGEN.

Place in a bottle of oxygen gas a lighted taper, and it will burn with a flame of increased brilliancy.



GAS AND STEAM.

89

FLAME FROM GOLD METALS.

Provide a bottle of the gas chlorine, which may be purchased of any operative chemist, and with it you may exhibit some brilliant experiments.

For example, reduce a small piece of the metal antimony to a very fine powder in a mortar; place some of this on a bent card, then loosen the stopper of the bottle of chlorine, and throw in the antimony, it will take fire spontaneously, and burn with much splendour; thus exhibiting a cold metal spontaneously bursting into flame.

If, however, a *lump* of antimony be dropped into the chlorine, there will be no spontaneous combustion, nor immediate change: but, in the course of time, the antimony will become incrustated with a white powder, and no chlorine will be found in the bottle

Or, provide copper in fine leaves, known as "Dutch metal;" slightly breathe on one end of a glass rod, about ten inches long, and cause one or two leaves of the metal to adhere to the damp end; then open a bottle of chlorine, quickly plunge in the leaves, when they will instantly take fire, and burn with a fine red light, leaving in the bottle a greenish-yellow solid substance.

A small *lump* of copper, or "Dutch metal," will not burn as above, but will be slowly acted upon, like the antimony.

Immerse gold leaf in a jar of chlorine gas, and combustion with a beautiful green flame will take place.



Or, fold a slip of blotting-paper into a match five inches long; dip it into oil of turpentine, drain it an instant, drop it into another bottle of chlorine, when it will burst into flame, and deposit much carbon.

CAOUTCHOUC BALLOONS.

Put a little ether into a bottle of caoutchouc, close it tightly, soak it in hot water, and it will become inflated to a considerable size. These globes may be made so thin as to be transparent.

A piece of caoutchouc, the size of a walnut, has thus been extended to a ball fifteen inches in diameter; and a few years since, a caoutchouc balloon, thus made, escaped from Philadelphia, and was found 130 miles from that city.

TO INCREASE THE LIGHT OF COAL GAS.

Lay a piece of wire-gauze upon the glass chimney of a common argand gas burner, when the flame will be enlarged to twice its former dimensions, and its light fully doubled. If the experiment be made with a common argand oil-lamp, the flame will be often enlarged, but so discoloured as to yield less light.

GAS FROM INDIAN RUBBER.

Put caoutchoucine, or the spirit distilled from caoutchouc or Indian rubber, into a phial, little more than sufficient to cover the bottom, and the remainder of the phial will be filled with a heavy vapour; pour this off the spirit into another phial, apply to it a piece of lighted paper, and the vapour will burn with a brilliant flame.



GAS. AND STEAM.

101

ETHER GAS.

Let fall a few drops of ether into a large drinking-glass, and cover it with a plate for a few minutes; during this time the glass will be filled with vapour from the ether, so that, on removing the plate, and applying a piece of lighted paper at the mouth of the glass, the invisible vapour will take fire; thus proving how readily a volatile fluid, such as ether, combines with the air.

MAGIC VAPOUR.

Provide a glass tube, about three feet long and half an inch in diameter, nearly fill it with water, upon the surface of which pour a little coloured ether; then close the open end of the tube carefully with the palm of the hand, invert it in a basin of water, and rest the tube against the wall: the ether will rise through the water to the upper end of the tube; pour a little hot water over the tube and it will soon cause the ether to boil within, and its vapour may thus be made to drive nearly all the water out of the tube into the basin; if, however, you then cool the tube by pouring cold water over it, the vaporized ether will again become a liquid, and float upon the water as before.

GAS FROM THE UNION OF METALS.

Nearly fill a wine glass with diluted sulphuric acid, and place in it a wire of silver and another of zinc, taking care that they do not touch each other; when the zinc will be changed by the acid, but the silver will remain inert. But, cause the upper ends of the wires to touch each other, and a stream of gas will issue from them



INVISIBLE GASES MADE VISIBLE.

Pour a little sulphuric acid upon some common salt in a saucer. Into another saucer put a mixture of about two parts of quick lime and one of sal ammoniac, both in powder, adding to these a very small quantity of boiling water. Each saucer apart will yield an invisible gas: but the moment they are brought closely together, very visible vapours will be the result.

LIGHT UNDER WATER.

Put into an *eau de Cologne* bottle two drachms of chlorate of potass, and upon that salt about a dozen chips of phosphorus, and fill up the bottle with cold water: provide a glass tube which will reach to the potass, through which pour half an ounce, by measure, of strong sulphuric acid, when a gas will instantly rise, give to the liquid a deep yellow colour, and inflame the phosphorus in a striking manner.

GASEOUS EVANESCENCE.

Add a tea-spoonful of fuming nitric acid to two tea-spoonfuls of spirit of wine, in a cup, and the liquids will presently disappear in the form of vapour.

VIOLET-COLOURED GAS.

Put three or four grains of iodine into a small clean Florence



Or, upon a small sheet of any metal, place a few grains of iodine, and add a chip of dry phosphorus; when the latter will flame, and the iodine pass off in a violet vapour.

TO COLLECT GASES.

Provide a moistened bladder, tie a piece of tobacco-pipe firmly into its neck, twisting it so as to expel the common air. This may be fitted to any vessel by means of the pipe, which may be fixed in the cork of a bottle containing gas, and closely luted with putty or clay, or powdered lime and white of egg.

THE DEFLAGRATING SPOON.

To introduce substances into gasses, a deflagrating spoon is required. It may be bought for half-a-crown; but an instrument equally useful may be made as follows: cut a piece of sheet copper somewhat larger than a sixpence, and bend it into a shallow, cup-like, form; twist four fine brass wires, each nine inches long, tightly together, leaving an inch at the extremities, which must be spread to hold the copper, as the strings or chains of a balance support the scale-pan. To complete it, take a piece of sheet lead, the size of a penny-piece; make a hole through the centre large enough to admit the twisted wires, but at the same time retaining them firmly in their position: then, if the wires will not rest in the lead by adhesion, the hole may be enlarged, the wire put in, and secured by a piece of solder. The spoon being then let down through the mouth of a bottle, the circular piece of lead rests upon and stops the mouth.

WHAT IS STEAM?

Invert a glass goblet over a cup of hot water, when the vapour or steam will be seen to rise in it, to condense upon the cold glass



and then to run down its inside; thus showing that steam is vaporized water, and will, when the heat is abstracted from it, become water again.

THE STEAM-ENGINE SIMPLIFIED.

The steam-engine is much more intelligible than its name at first suggests. That part by which the machinery is set in motion, may be compared to a syringe or squirt, the rod of which is driven up and down by steam admitted above and below, one end of the rod being connected with the machinery to be worked. Thus, the piston is made to turn the wheels of a railway carriage, or the paddles of a steam-boat.

The elastic force of the steam, or vapour, by which the rod is driven up and down, may be explained by this simple experiment. Provide a test tube, put into it a little water, hold the thumb over the mouth, and cause the water to boil by holding it over a spirit-lamp. There will soon be felt a pressure against the thumb; when, if the tube be dipped into cold water, the thumb being still held at the end, a kind of suction will be felt against it. Now, the tube resembles the cylinder of the steam-engine, in which the piston moves up and down; to imitate which, wrap a little tow about the end of a piece of stick, grease it with tallow, and fit it moderately tight into the tube; when the water is made to boil, the stick will be raised, and when the end is dipped into cold water, the stick will fall as the piston rises and falls in the cylinder.

TO BOIL WATER BY STEAM.

Nearly fill a retort with water, and boil it over a lamp; then immerse the beak into a tumbler of cold water, and the disengaged



GAS AND STEAM.

105

steam will raise the water to the boiling temperature, though it be at a distance from the source of heat.

DISTILLATION IN MINIATURE.

Fill a kettle with water, and set it on the fire; fix a long metal tube to the spout, and as soon as the water boils, the steam will pass into the tube, and being condensed into water, will drip at the other end of the tube, which corresponds with the worm in the still; it soon, however, becomes as hot as the water, and then the condensation will cease: but were the tube passed through cold water, as is the worm of the still in a tub, the whole water in the kettle might be boiled away, but reproduced in the tube, and collected from it without the loss of a drop. This simple process resembles distillation, and the kettle and tube the still.

CANDLE OR FIRE CRACKERS.

Provide a number of little glass bulbs, put into each a drop of water, and seal it up; if it then be put into the flame of a candle, or the fire, the heat will soon convert the water into steam, and cause the bulb to burst with a loud report.

STEAM FROM THE KETTLE.

Observe attentively the steam that escapes from the spout of a tea-kettle at the moment the water begins to boil, and you will



throughout which not a particle of steam will be perceptible. This may be easily explained. When the water in the kettle begins to boil, the spout being cooler than the steam issuing from it, a portion of that steam is condensed. As more steam escapes, the metal soon becomes as hot as the steam, will no longer condense it, and the spout becomes dry. By this time the steam will displace the air immediately opposite the orifice of the spout, whence it will issue dry and invisible. As it is cooled by mixing with the surrounding air, it assumes its well-known cloudy appearance.





FIRE, WATER, AND AIR.

COLOURED FLAMES.



VARIETY of rays of light is exhibited by coloured flames, which are not to be seen in white light. Thus pure hydrogen gas will burn with a blue flame, in which many of the rays of light are wanting. The flame of an oil-lamp contains most of the rays which are wanting in sunlight. Alcohol, mixed with water, when heated or burned, affords a flame with no other rays but yellow. The



110

FIRE, WATER, AND AIR.

Muriate of lithia	Red. <i>Kl Cl</i>
Muriate of baryta	Pale <i>apple-green</i> .
Muriate of copper	Bluish-green.
Borax	Green.

Or, either of the above salts may be mixed with spirit of wine, as directed for Red Fire.

YELLOW FLAME.

Burn spirits of wine on common table salt or saltpetre.

ORANGE-COLOURED FLAME.

CaCl
Burn spirit of wine on chloride of calcium, a substance obtained by evaporating muriate of lime to dryness.

EMERALD GREEN FLAME.

Burn spirit of wine on a little powdered nitrate of copper

INSTANTANEOUS FLAME.

Heat together potassium and sulphur, and they will instantly burn very vividly.

Heat a little nitre in a fire-shovel, sprinkle on it flour of sulphur, and it will instantly burn. If iron filings be thrown upon red-hot nitre, they will detonate and burn.

Pound, separately, equal parts of chlorate of potash and lump sugar; mix them, and put upon a plate a small quantity; dip a thread into sulphuric acid, touch the powder with it, and it will burst into a brilliant flame.



FIRE, WATER, AND AIR.

111

Or, put a few grains of chlorate of potash into a table-spoonful of spirit of wine; add one or two drops of sulphuric acid, and the whole will burst into a beautiful flame.

THE CUP OF FLAME.

Put a little newly calcined magnesia into a tea-cup upon the hearth or hob, and suddenly pour in as much concentrated sulphuric acid as will cover the magnesia; in an instant, sparks will be thrown out, and the mixture will become completely ignited. To prevent accidents, the phial containing the sulphuric acid should be tied to the end of a long stick.

TO COOL FLAME BY METAL.

Encircle the very small flame of a lamp with a cold iron wire, which will instantly cause its extinction.

PROOF THAT FLAME IS HOLLOW.

Pour some spirit of wine into a watch-glass, and inflame it; place a straw across this flame, and it will only be ignited and charred at the outer edge; the middle of the straw will be uninjured, for there is no ignited matter in the centre of the flame.

**GREEN FIRE.**

A beautiful green fire may be thus made. Take of flour of sulphur, thirteen parts; nitrate of baryta, seventy-seven; oxy-muriate of potassa, five; metallic arsenic, two; and charcoal, three. Let the nitrate of baryta be well dried and powdered; then add to it the other ingredients, all finely pulverized and exceedingly well mixed and rubbed together. Place a portion of the composition in a small tin pan, having a polished reflector fitted to one side, and set light to it; when a splendid green illumination will be the result. By adding a little calamine, it will burn more slowly.

BRILLIANT RED FIRE.

Weigh five ounces of dry nitrate of strontia, one ounce and a half of finely-powdered sulphur, five drachms of chlorate of potash, and four drachms of sulphuret of antimony. Powder the chlorate of potash and the sulphuret of antimony separately in a mortar, and mix them on paper; after which, add them to the other ingredients, previously powdered and mixed. No other kind of mixture than rubbing together on paper is required. For use, mix with a portion of the powder a small quantity of spirit of wine in a tin pan resembling a cheese-toaster, light the mixture, and it will shed a rich crimson hue: when the fire burns dim and badly, a very small quantity of finely-powdered charcoal or lampblack will revive it.

PURPLE FIRE.

Dissolve chloride of lithium in spirit of wine; and when lighted, it will burn with a purplish flame



SILVER FIRE.

Place upon a piece of burning charcoal a morsel of the dried crystals of nitrate of silver, (not the lunar caustic,) and it will immediately throw out the most beautiful sparks that can be imagined, whilst the surface of the charcoal will be coated with silver.

THE FIERY FOUNTAIN.

Put into a glass tumbler fifteen grains of finely granulated zinc, and six grains of phosphorus cut into very small pieces, beneath water. Mix in another glass, gradually, a drachm of sulphuric acid with two drachms of water. Remove both glasses into a dark room, and there pour the diluted acid over the zinc and phosphorus in the glass; in a short time, beautiful jets of bluish flame will dart from all parts of the surface of the mixture; it will become quite luminous, and beautifully luminous smoke will rise in a column from the glass; thus representing a fountain of fire

THE ARTIFICIAL CONFLAGRATION.

Put into a small narrow-necked earthen bottle, half an ounce of muriate of ammonia, an ounce of camphor, and two ounces of



COMBUSTION WITHOUT FLAME.

Light a small green wax taper; in a minute or two blow out the flame, and the wick will continue red-hot for many hours; and, if the taper were regularly and carefully uncoiled, and the room kept free from currents of air, the wick would burn on in this manner until the whole taper were consumed. The same effect is not produced when the colour of the wax is red, on which account red wax-tapers are safer than green; for the latter, if left imperfectly extinguished, may set fire to any object with which they are in contact.

COMBUSTION OF THREE METALS.

Mix a grain or two of potassium with an equal quantity of sodium; add a globule of quicksilver, and the three metals when shaken, will take fire and burn vividly.

TO MAKE PAPER INCOMBUSTIBLE.

Take a smooth cylindrical piece of metal, about one inch and a half in diameter and eight inches long; wrap very closely round it a piece of clean writing paper, then hold the paper in the flame of a spirit-lamp, and it will not take fire; but it may be held there for a considerable time, without being in the least affected by the flame.

SINGULAR EXPERIMENTS WITH GLASS TUBES.

A most remarkable phenomenon is produced in glass tubes, under certain circumstances. When these are laid before a fire in a horizontal position, having their extremities properly supported, they acquire a rotatory motion round their axis, and also :



progressive motion towards the fire, even when their supports are declining from the fire, so that the tube will move a little way upwards to the fire. When the progressive motion of the tubes towards the fire is stopped by any obstacle, their rotation still continues. When the tubes are placed in a nearly upright posture, leaning to the right hand, the motion will be from east to west; but if they lean to the left hand, the motion will be from west to east; and the nearer they are placed to the upright posture, the less will the motion be either way. If the tube be placed horizontally on a glass plane, the fragment, for instance, of coach window glass, instead of moving towards the fire, it will move from it, and about its axis in a contrary direction to what it had done before; nay, it will recede from the fire, and move a little upwards, when the plane inclines towards the fire. These experiments succeed best with tubes about twenty or twenty-two inches long, which have in each end a pretty strong pin fixed in cork for their axis.

AQUATIC BOMB.

Drop about two grains of potassium into a saucer of cold water. It will instantly burst into flame, with a slight explosion, burn vividly on the surface, and dart about with great violence in the form of a red-hot fireball.

HEAT NOT TO BE ESTIMATED BY TOUCH.

Hold both hands in water which causes the thermometer to rise



After holding the hands thus for some time, remove them, and again immerse them in the water at ninety degrees; when you will feel *warmth* in one hand and *cold* in the other. To the hand which had been immersed in the water at thirty-two degrees, the water at ninety degrees will feel hot; and to the hand which had been immersed in the water at 200 degrees, the water at ninety degrees will feel cold. If, therefore, the touch in this case be trusted, the same water will be judged to be hot and cold at the *same* time.

FLAME UPON WATER.

Fill a wine-glass with cold water, pour lightly upon its surface a little ether; light it by a slip of paper, and it will burn for some time

ROSE-COLOURED FLAME ON WATER.

Drop a globule of potassium, about the size of a large pea, into a small cup nearly full of water, containing a drop or two of strong nitric acid; the moment that the metal touches the liquid, it will float upon its surface, enveloped with a beautiful rose-coloured flame, and entirely dissolve.

TO SET A MIXTURE ON FIRE WITH WATER.

Pour into a saucer a little sulphuric acid, and place upon it a chip of sodium, which will float and remain uninfamed; but the addition of a drop of water will set it on fire.

WAVES OF FIRE ON WATER.

On a lump of refined sugar let fall a few drops of phosphuretted ether, and put the sugar into a glass of warm water.



which will instantly appear on fire at the surface, and in waves, if gently blown with the breath. This experiment should be exhibited in the dark.

EXPLOSION IN WATER.

Throw very small pieces of phosphuret of potassium into a basin of water, and they will produce separate explosions. The same substance will also burn with great brilliancy, when exposed to air.

WATER FROM THE FLAME OF A CANDLE.

Hold a cold and dry bell-glass over a lighted candle, and watery vapour will be directly condensed on the cold surface; then close the mouth of the glass with a card or plate, and turn the mouth uppermost; remove the card, quickly pour in a little lime-water, a perfectly clear liquid, and it will instantly become turbid and milky, upon meeting with the contents of the glass, just as lime-water changes when dropped into a glass of water.

FORMATION OF WATER BY FIRE.

Put into a tea-cup a little spirit of wine, set it on fire, and invert a large bell-glass over it. In a short time, a thick watery vapour will be seen upon the inside of the bell, which may be collected by a dry sponge.

BOILING UPON COLD WATER.

Provide a tall glass jar, filled with cold water, and place in it an air thermometer, which will nearly reach the surface; upon the surface place a small copper basin, into which put a little live charcoal; the surface of the water will soon be made to boil,



while the thermometer will show that the water beneath is scarcely warmer than it was at first.

CURRENTS IN BOILING WATER.

Fill a large glass tube with water, and throw into it a few particles of bruised amber; then hold the tube by a handle for the purpose, upright in the flame of a lamp, and as the water becomes warm, it will be seen that currents, carrying with them the pieces of amber, will begin to ascend in the centre, and to descend towards the circumference of the tube. These currents will soon become rapid in their motions, and continue till the water boils.

HOT WATER LIGHTER THAN COLD.

Pour into a glass tube, about ten inches long, and one inch in diameter, a little water coloured with pink or other dye; then fill it up gradually and carefully with colourless water, so as not to mix them; apply heat at the bottom of the tube, and the coloured water will ascend and be diffused throughout the whole.

The circulation of warm water may be very pleasingly shown by heating water in a tube similar to the foregoing; the water having diffused in it some particles of amber, or other light substance not soluble in water.

EXPANSION OF WATER BY COLD.

All fluids except water diminish in bulk till they freeze. Thus, fill a large thermometer tube with water, say of the temperature of eighty degrees, and then plunge the bulb into pounded ice and salt, or any other freezing mixture: the water will go on shrinking in the tube till it has attained the temperature of about forty degrees; and then, instead of continuing to contract till it freezes, (as is the case



with all other liquids,) it will be seen slowly to expand and consequently to rise in the tube until it congeals. In this case, the expansion below forty degrees and above forty degrees, seems to be equal : so that the water will be of the same bulk at thirty-two degrees as at forty-eight degrees, that is, at eight degrees above or below forty degrees.

THE CUP OF TANTALUS.

This pretty toy may be purchased at any optician's for two or three shillings. It consists of a cup, in which is placed a standing human figure concealing a syphon, or bent tube with one end longer than the other. This rises in one leg of the figure to reach the chin, and descends through the other leg through the bottom of the cup to a reservoir beneath. If you pour water in the cup it will rise in the shorter leg by its upward pressure, driving out the air before it through the longer leg; and when the cup is filled above the bend of the syphon, (that is, level with the chin of the figure,) the pressure of the water will force it over into the longer leg of the syphon, and the cup will be emptied: the toy thus imitating Tantalus of mythology, who is represented by the poets as punished in Erebus with an insatiable thirst, and placed up to the chin in a pool of water, which, nowever, flowed away as soon as he attempted to taste it.

IMITATIVE DIVING BELL.



THE WATERPROOF SIEVE.

Fill a very fine wire-gauze sieve with water, and it will not run through the interstices, but be retained among them by capillary attraction.

MORE THAN FULL.

Fill a glass to the brim with water, and you may add to it spirit of wine without causing the water to overflow, as the spirit will enter into the pores of the water.

. TO CAUSE WINE AND WATER TO CHANGE PLACES.

Fill a small narrow-necked bulb with port wine, or with water and coloured spirit of wine, and put the bulb into a tall, narrow glass jar, which is then to be filled up with cold water; immediately the coloured fluid will issue from the bulb, and accumulate on the surface of the water in the jar, while colourless water will be seen accumulating at the bottom of the bulb. By close inspection, the descending current of the water may also be observed, and the coloured and the colourless liquids be seen to pass each other in the narrow neck of the bulb without mixing.

The whole of the coloured fluid will shortly have ascended and the bulb will be entirely filled with clear water.

PYRAMID OF ALUM.

Put a lump of alum into a tumbler of water, and, as the alum dissolves, it will assume the shape of a pyramid. The cause of the alum decreasing in this peculiar form is briefly as follows: at first, the water dissolves the alum very fast, but as the alum becomes united with the water, the solvent power of the latter diminishes. The water, which combines first with the alum, be-



comes heavier by the union, and falls to the bottom of the glass where it ceases to dissolve any more, although the water which it has displaced from the bottom has risen to the top of the glass and is there acting upon the alum. When the solution has nearly terminated, if you closely examine the lump, you will find it covered with geometrical figures, cut out, as it were, in relief, upon the mass; showing, not only that the cohesion of the atoms of the alum resists the power of solution in the water, but that, in the present instance, it resists it more in some directions than in others. Indeed this experiment beautifully illustrates the opposite action of cohesion and repulsion.

VISIBLE VIBRATION.

Provide a glass goblet about two-thirds filled with coloured water, draw a fiddle-bow against its edge, and the surface of the water will exhibit a pleasing figure, composed of fans, four, six, or eight in number, dependant on the dimensions of the vessel, but chiefly on the pitch of the note produced.



Or, nearly fill a glass with water, draw the bow strongly against its edge, the water will be elevated and depressed; and, when the vibration has ceased, and the surface of the water has become

unstill, these elevations will be exhibited in the form of a curved



portion of the glass between the edge and the curved line, will then be seen partially sprinkled; but between the level of the water and the curved line, it will have become wholly wetted thereby indicating the height to which the fluid has been thrown

CHARCOAL IN SUGAR

The elements of sugar are carbon and water, as may be proved by the following experiment: Put into a glass a table-spoonful of powdered sugar, and mix it into a thin paste with a little water, and rather more than its bulk of sulphuric acid; stir the mixture together, the sugar will soon blacken, froth up, and shoot like a cauliflower out of the glass: and, during the separation of the charcoal, a large quantity of steam will also be evolved.

FLOATING NEEDLES.

Fill a cup with water, gently lay on its surface small fine needles, and they will float.

WATER IN A SLING.

Half fill a mug with water, place it in a sling, and you may

**TO PREVENT CORK FLOATING IN WATER.**

Place at the bottom of a vessel of water, a piece of cork, so smoothly cut that no water gets between its lower surface and the surface of the bottom, when it will not rise, but remain fixed there, because it is pressed downward by the water from above, and there is no pressure from below to counterbalance it.

INSTANTANEOUS FREEZING.

During frosty weather, let a vessel be half filled with water cover it closely, and place it in the open air, in a situation where it will not experience any commotion: it will thereby frequently acquire a degree of cold more intense than that of ice, without being frozen. If the vessel, however, be agitated ever so little, or receive even a slight blow, the water will immediately freeze with singular rapidity. The cause of this phenomenon is, that water does not congeal unless its particles unite together, and assume among themselves a new arrangement. The colder the water becomes, the nearer its particles approach each other; and the fluid which keeps it in fusion gradually escapes; but the shaking of the vessel destroys the equilibrium, and the particles fall one upon another, uniting in a mass of ice.

Or, provide a glass full of cold water, and let fall on its surface a few drops of sulphuret of carbon, which will instantly become covered with icy network: feathery branches will then dart from the sulphuret, the whole contents of the glass will become solidified, and the globules will exhibit all the colours of the rainbow.

TO FREEZE WATER WITH ETHER.

Fill a very thin glass tube with water. Close it at one end, and wrap muslin round it: then frequently immerse the tube in



strong ether, allowing what the muslin soaks each time to evaporate, and in a short time the water will be frozen.

PRODUCTION OF NITRE.

Dip a piece of paper into a filtered solution of saltpetre. If its colour be changed to brown, a drop or two more of acid must be cautiously applied: if, on the contrary, it reddens litmus paper, a small globule or two of potassium will be required; the object being to obtain a neutral solution: if it then be carefully evaporated to about half its bulk, and set aside, beautiful crystals will begin to form, which will be those of the nitrate of potash, commonly called nitre or saltpetre.

CURIOUS TRANSPOSITION.

Take a glass of jelly, and place it mouth downward, just under the surface of warm water in a basin: the jelly will soon be dissolved by the heat, and, being heavier than the water, it will sink, while the glass will be filled with water in its stead.

ANIMAL BAROMETER.

Keep one or two leeches in a glass bottle nearly filled with water; tie the mouth over with coarse linen, and change the water every two or three days. The leech may then serve for a barometer, as it will invariably ascend or descend in the water as the weather changes from dry to wet; and it will generally come to the surface prior to a thunder-storm.

MAGIC SOAP.

Pour into a phial a small quantity of oil, with the same of water, and, however violently you shake them, they cannot be



mixed, for the water and oil have no affinity for each other; but, if a little ammonia be added, and the phial be then shaken, the whole will be mixed into a liquid soap.

EQUAL PRESSURE OF WATER.

Tie up in a bladder of water, an egg and a piece of very soft wax, and place it in a box, so as to touch its sides and bottom; then lay loosely upon the bladder a brass or other metal plate, upon which place a hundred pounds weight, or more; when the egg and the wax, though pressed by the water with all its weight, being equally pressed in all directions, will not be in the least either crushed or altered in shape.

TO EMPTY A GLASS UNDER WATER.

Fill a wine-glass with water, place over its mouth a card, so as to prevent the water from escaping, and put the glass, mouth downwards, into a basin of water. Next, remove the card, and raise the glass partly above the surface, but keep its mouth below the surface, so that the glass still remains completely filled with water. Then insert one end of a quill or reed in the water below



DECOMPOSITION OF WATER.

The readiest means of decomposing water is as follows. Take a gun-barrel, the breech of which has been removed, and fill it with iron wire, coiled up. Place it across a chafingdish filled with lighted charcoal, and connect to one end of the barrel a small glass retort, containing some water, and to the other a bent tube, opening under the shelf of a water bath. Heat the barrel red-hot, and apply a lamp under the retort: the stream of water, in passing over the red-hot iron of the barrel, will be decomposed, the oxygen will unite with the iron, and the hydrogen may be collected in the form of gas at the end of the tube over the water.

WATER HEAVIER THAN WINE.

Let a tumbler be half-filled with water, and fit upon its surface a piece of white paper, upon which pour wine; then carefully draw out the paper, say with a knitting-needle, so as to disturb the liquids as little as possible, and the water, being the heavier, will continue at the lower part of the glass; whilst the wine, being the lighter, will keep above it. But, if a glass be first half-filled with wine, and water be poured over it, it will at once sink through the wine, and both liquids will be mixed.

TO INFLATE A BLADDER WITHOUT AIR.

Put a tea-spoonful of ether into a moistened bladder, the neck of which tie up tightly; pour hot water upon the bladder, and the ether, by expanding, will fill it out.

AIR AND WATER BALLOON.

Procure a small hollow glass vessel, the shape of a balloon, the lower part of which is open, and place it in water with the



mouth downwards, so that the air within prevents the water filling it. Then fill a deep glass jar nearly to the top with water, and place the balloon to float on its surface; tie over the jar with bladder, so as to confine the air between it and the surface of the water. Press the hand on the bladder, when more water will enter the balloon, and it will soon sink to the bottom of the jar; but, on removing your hand, the balloon will again ascend slowly to the surface.

HEATED AIR BALLOON.

Make a balloon, by pasting together gores of bank post paper; paste the lower ends round a slender hoop, from which proceed several wires, terminating in a kind of basket, sufficiently strong to support a sponge dipped in spirit of wine. When the spirit is set on fire, its combustion will produce a much greater degree of heat than any ordinary flame: and by thus rarefying the air within the balloon, will enable it to rise with great rapidity to a considerable height.

THE PNEUMATIC TINDER-BOX.

Provide a small stout brass tube, about six inches long, and half an inch in diameter, closed at one end, and fitted with a hollow air-tight piston, containing in its cavity a scrap of amadou, or German tinder. Suddenly drive the piston into the tube by a strong jerk of the hands; and the compression of the air in the tube will give out so much heat as to light the tinder; and upon



across a cask, in which are two separate compartments. Put into one of them a portion of wine or coloured liquid, and place the apparatus under the exhausted receiver of an air-pump, when the elastic force of the confined air will cause the liquid to ascend a transparent glass tube (fitted on purpose) into the mouth of the Bacchanalian figure. To render the experiment more striking, a bladder, with a small quantity of air therein, is fastened around the figure, and covered with a loose silken robe, when the air in the bladder will expand, and produce an apparent increase in the bulk of the figure, as if occasioned by the excess of liquor drunk.

THE MYSTERIOUS CIRCLES.

Cut from a card two discs or circular pieces, about two inches in diameter: in the centre of one of them make a hole, into which put the tube of a common quill, one end being even with the surface of the card. Make the other piece of card a little convex, and lay its centre over the end of the quill, with the concave side of the card downward; the centre of the upper card being from one-eighth to one-fourth of an inch above the end of the quill. Attempt to blow off the upper card by blowing through the quill, and it will be found impossible.

If, however, the edges of the two pieces of card be made to fit each other very accurately, the upper card will be moved and



three or four feet in height. When, from the humidity of the breath, the upper surface of the perforated card has a little expanded, and the two opposite sides are somewhat depressed, these depressed sides may be distinctly seen to rise and approach the upper card, directly in proportion to the force of the current of air

Another fact to be shown with this simple apparatus, appears equally inexplicable with the former. Lay the loose card upon the hand with the concave side up; blow forcibly through the tube, and, at the same time, bring the two cards towards each other, when, within three-eighths of an inch, if the current of air be strong, the loose card will suddenly rise and adhere to the perforated card. If the card through which the tube passes have several holes made in it, the loose card may be instantly thrown off by a slight puff of air.

For the explanation of the above phenomenon, a gold medal and one hundred guineas were offered, some years since, by the Royal Society. Such explanation has been given by Dr. Robert Hare, of Philadelphia, and is as follows:

Supposing the diameter of the discs of card to be to that of the hole as 8 to 1, the area of the former to the latter must be as 64 to 1. Hence, if the discs were to be separated (their surfaces remaining parallel) with a velocity as great as that of the air blast, a column of air must meanwhile be interposed, sixty-four times greater than that which would escape from the tube during the interim: consequently, if all the air necessary to preserve



a deficit of pressure be created between the discs, unfavourable to their separation.

It follows, then, that, under the circumstances in question, the discs cannot be made to move asunder with a velocity greater than one-sixty-fourth of that of the blast. Of course, all the force of the current of air through the tube will be expended on the movable disc, and the thin ring of air which exists around the orifice between the discs: and, since the movable disc can only move with one-sixty-fourth of the velocity of the blast, the ring of air in the interstice must experience nearly all the force of the jet, and must be driven outwards, the blast following it in various currents, radiating from the common centre of the tube and discs.

PRINCE RUPERT'S DROPS.

Let fall melted glass into cold water, and it will become suddenly cooled and solidified on the outside before the internal part is changed; then, as this part hardens, it is kept extended by the arch of the outside crust: and, if the finely drawn-out point of the drop be broken off, the cohesion of the atoms of the glass is destroyed, and the whole crumbles to dust with a smart explosion.

VEGETABLE HYGROMETER.

The dampness of the air, and the consequent approach of rain, is denoted by several simple means, which are termed hygrometers. Thus, if an ear of the wild oat be hung up, its awn or bristly



their diameter, but reduces their length; hence, catgut is used in the construction of a weather-house, in which the man and woman foretell wet or dry weather, moving as the catgut stretches or contracts, according as the air is moist or dry.

To prove the moving power of the awn, separate one from the ear, and, holding the base between the finger and thumb, moisten the awn with the lips, when it will be seen to turn round for some time.

THE PNEUMATIC DANCER.

This amusing pneumatic toy consists of a figure made of glass or enamel, and so constructed as to remain suspended in a glass jar of water. An air-bubble, communicating with the water, is placed in some part of the figure, shown at *m*, near the top of the jar, *A*, in the engraving. At the bottom of the vessel, *B*, is a bladder, which can be pressed upwards by applying the finger to the extremity of a lever, *c o*, when the pressure will be communicated through the water to the bubble of air, which is thus compressed. The figure will then sink to the bottom; but, by removing the pressure, the figure will again rise, so that it may be made to dance in the vessel, as if by magic. Fishes made of glass, are sometimes substituted for the hu-





THE ASCENDING SNAKE.

To construct this pretty little pneumatic toy, take a square piece of stiff card, or sheet copper or brass, about two and a half

Fig. 2.



Fig. 1.



or three inches in diameter, and cut it out spirally, so as to resemble a snake, as in the engraving, (fig. 1.) Then paint the body on each side of the card the colours of a snake; take it by the two ends, and draw out the spiral till the distance from head to tail is six or seven inches, as in

fig. 2. Next, provide a slender piece of wood on a stand, and fix a sharp needle to its summit; push the rod up through the spiral, and let the end of the spiral rest upon the summit of the needle. Now place the apparatus as nearly as possible to the edge of the mantel-shelf above the fire, and the snake will begin to revolve in the direction of its head; and, if the fire be strong, or the current of heated air which ascends from it is made powerful, by two or three persons coming near it, so as to concentrate the current, the snake will revolve very rapidly. The rod, *a b*, should be painted so as to resemble a tree, which the snake will appear to climb; or the snake may be suspended by a thread from the ceiling, over the current of air from a lamp. Two snakes may be made to turn round in opposite directions, by merely drawing out the spiral of one from the upper side, and of the other from the under side of the figure, and fixing them, of course, on separate rods.

THE PNEUMATIC PHIAL.

Provide a phial one-fourth filled with any coloured water and with a glass tube passing through the cork, or cemented into the



FIRE, WATER, AND AIR.

133

neck of the phial, so as to be air-tight; the tube may reach to within a quarter of an inch of the bottom of the phial, so as to dip below the surface of the liquid. Hold this little instrument before the fire, or plunge it into hot water, when the air that is in the phial will expand, and force up the coloured liquor into the tube.

RESIN BUBBLES.

Dip the bowl of a tobacco-pipe into melted resin, hold the pipe in a vertical position, and blow through it; when bubbles of various sizes will be formed, of a brilliant silvery hue, and in a variety of colours.

MOISTURE OF THE ATMOSPHERE.

Moisture is always present in the air, even when it is driest. To prove this, press a piece of sheet copper into the form of a cup; place on it a piece of phosphorus, thoroughly dried between blotting-paper; put the cup on a dry plate, and beside it a small piece of quick-lime; turn over it a glass tumbler, and leave it for ten minutes, that the lime may remove all moisture from the included air; take off the tumbler, touch the phosphorus with a hot wire, and instantly replace the glass; when a dry solid will be formed, resembling snow. As soon as the flame is extinct, examine the plate; when the solid will, in a very short time,



doors; and the light air must find some vent, to make way for the heavy air. If the door be set ajar, and a candle held near the upper part of it, the flame will be blown outwards, shewing that there is a current of air flowing out from the upper part of the room; and if the candle be placed on the floor, close by the door the flame will bend inwards, showing that there is also a current of air setting into the lower part of the room. The upper current is the warm, light air, which is driven out to make way for the stream of cold, dense air which enters below.

BUBBLES ON CHAMPAGNE

Pour out a glass of champagne, or bottled ale, and wait till the effervescence has ceased; you may then renew it by throwing into the liquor a bit of paper, a crumb of bread, or even by violently shaking the glass. The bubbles of carbonic acid chiefly rise from where the liquor is in contact with the glass, and are in greatest abundance at those parts where there are asperities. The bubbles setting out from the surface of the glass are at first very small; but they enlarge in passing through the liquor. It seems as if they proceeded more abundantly from the bottom of the glass than from its sides; but this is an ocular deception.

PROOFS THAT AIR IS A HEAVY FLUID.

Expel the air out of a pair of bellows, then close the nozzle and valve-hole beneath, and considerable force will be requisite to separate the boards from each other. This is caused by the pressure or weight of the atmosphere, which, acting equally upon the upper and lower boards externally, without any air inside, operates like a dead weight in keeping the boards together. In like manner, if you stop the end of a syringe, after its piston rod



has been pressed down to the bottom, and then attempt to draw it up again, considerable force will be requisite to raise it, depending upon the size of the syringe, being about fourteen or fifteen pounds to every square inch of the piston rod. When the rod is drawn up, unless it be held, it will fall to the bottom, from the weight of the air pressing it in.

Or, fill a glass tumbler to the brim with water, cover it with a piece of thin wet leather, invert it on a table, and try to pull it straight up, when it will be found to require considerable force. In this manner do snails, periwinkles, limpets, and other shells adhere to rocks, &c. Flies are enabled to walk on the ceiling of a room, up a looking-glass, or window-pane, by the air pressing on the outside of their peculiarly constructed feet, and thus supporting them.

To the same cause must be attributed the firmness with which the oyster closes itself; for, if you grind off a part of the shell, so as to make a hole in it, though without at all injuring the fish, it may be opened with great ease.

TO SUPPORT A PEA ON AIR.

This experiment may be dexterously performed by placing a pea upon a quill, or the stem of a tobacco-pipe, and blowing upwards through it.

PYROPHORUS, OR AIR-TINDER.

Mix three parts of alum with one of wheat flour and put them



the mouth of the phial; when this flame disappears, remove the crucible from the fire, and when cold stop the phial with a good cork. If a portion of this powder be exposed to the air, it will take fire.

Or, a very perfect and beautiful pyrophorus may be obtained by heating tartrate of lead in a glass tube, over a lamp. When some of the dark-brown mass thus formed is shaken out in the air, it will immediately inflame, and brilliant globules of lead cover the ignited surface.

Or, mix three parts of lamp-black, four of burnt alum, in powder, and eight of pearl-ash, and heat them for an hour, to a bright cherry red, in an iron tube. When well made, and poured out upon a glass plate or tile, this pyrophorus will kindle, with a series of small explosions, somewhat like those produced by throwing potassium upon water; but this effect should be witnessed from a distance.

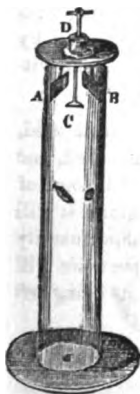
Put a small piece of grey cast-iron into strong nitric acid, when a porous, spongy substance will be left untouched, and will be of a dark grey colour, resembling plumbago. If some of this be put upon blotting-paper, in the course of a minute it will



other round the top of it. The colour in the centre of the rings will vary with the thickness; but, as the bubble grows thinner, the rings will spread, the central spot will become white, then bluish, and then black; after which the bubble will burst, from its extreme tenuity at the black spot, where the thickness has been proved not to exceed the 2,500,000th part of an inch.

**WHY A GUINEA FALLS MORE QUICKLY THAN A FEATHER
THROUGH THE AIR.**

The resistance of the air to falling bodies is not proportioned to the weight, but depends on the surface which the body opposes to the air. Now the feather exposes, in proportion to its weight, a much greater surface to the air than a piece of gold does, and therefore suffers a much greater resistance to its descent. Were the guinea beaten to the thinness of gold-leaf, it would be as long, or even longer, in falling than the feather; but let both fall in a vacuum, or under the receiver of an air-pump from which the air has been pumped out, and they will both reach the bottom at the same time; for gravity, acting independently of other forces, causes all bodies to descend with the same velocity.



An apparatus for performing this experiment is shown in the engraving: the coin and feather are to be laid together on the brass flap, A or B: this may be let down by turning the wire, C, which passes through a collar of leather, D, placed in the head of the receiver.



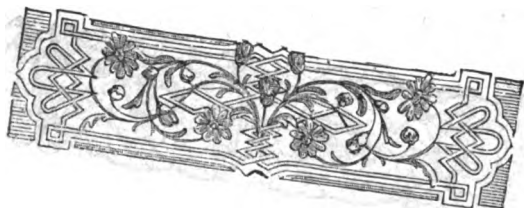
SOLIDITY OF AIR.

Provide a glass tube, open at each end; close the upper end by the finger, and immerse the lower one in a glass of water, when it will be seen that the air is material, and occupies its own space in the tube, for it will not permit the water to enter it until the finger is removed, when the air will escape, and the water rise to the same level in the inside as on the outside of the tube.

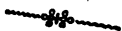
BREATHING AND SMELLING.

Hold the breath, and place the open neck of a phial containing oil of peppermint, or any other essential oil, in the mouth, and the smell will not be perceived; but after expiration it will be easily recognised.





SLEIGHTS AND SUBTLETIES.



THE chief requisites for success in the performance of feats of magic are manual dexterity and self-possession. The former can only be acquired by practice, the latter will be the natural result of a well-grounded confidence. We subjoin a few

derable importance to the

1. A



o fail in one, or have reason to believe that your operations are suspected, you may be prepared with another.

3. Never venture on a feat requiring manual dexterity till you have previously practised it so often as to acquire the necessary expertness.

4. As diverting the attention of the company from too closely inspecting your manœuvres is a most important object, you should manage to talk to them during the whole course of your proceedings. It is the plan of vulgar operators to gabble unintelligible jargon, and attribute their feats to some extraordinary and mysterious influence. There are few persons at the present day credulous enough to believe such trash, even among the rustic and most ignorant; but as the youth of maturer years might inadvertently be tempted to pursue this method while exhibiting his skill before his younger companions, it may not be deemed superfluous to offer a caution against such a procedure. He may state, and truly, that every thing he exhibits can be accounted for on rational principles, and is only in obedience to the unerring laws of Nature; and although we have just cautioned him against enabling the company themselves to detect his operations, there can be no objection (particularly when the party comprises many younger than himself) to occasionally show by what simple means the most apparently marvellous feats are accomplished.



SLEIGHTS AND SUBTLETIES.

143

THE RING AND THE HANDKERCHIEF.

This may be justly considered one of the most surprising sleights; and yet it is so easy of performance, that any one may accomplish it after a few minutes' practice.

You previously provide yourself with a piece of brass wire, pointed at both ends, and bent round so as to form a ring, about the size of a wedding-ring. This you conceal in your hand. You then commence your performance by borrowing a silk pocket-handkerchief from a gentleman, and a wedding-ring from a lady; and you request one person to hold two of the corners of the handkerchief, and another to hold the other two, and to keep them at full stretch. You next exhibit the wedding-ring to the company, and announce that you will make it appear to pass through the handkerchief. You then place your hand under the handkerchief, and substituting the false ring, which you had previously concealed, press it against the centre of the handkerchief, and desire a third person to take hold of the ring through the handkerchief, and to close his finger and thumb through the hollow of the ring. The handkerchief is held in this manner for the purpose of showing that the ring has not been placed within a fold. You now desire the persons holding the corners of the handkerchief to let them drop; the person holding the ring (through the handkerchief as already described) still retaining his hold.

Let another person now grasp the handkerchief as tight as he pleases, three or four inches below the ring, and tell the person



false ring, by bending one of its points a little aside, and bringing one point gently through the handkerchief, you easily draw out the remainder; being careful to rub the hole you have made in the handkerchief with your finger and thumb, to conceal the fracture.

You then put the wedding-ring you borrowed over the outside of the middle of the handkerchief, and desiring the person who holds the hat to take it away, you exhibit the ring (placed as described) to the company.

THE KNOTTED HANDKERCHIEF.

This feat consists in tying a number of hard knots in a pocket-handkerchief borrowed from one of the company, then letting any person hold the knots, and by the operator merely shaking the handkerchief, all the knots become unloosed, and the handkerchief is restored to its original state.

To perform this excellent trick, get as soft a handkerchief as possible, and taking the opposite ends, one in each hand, throw the right hand over the left, and draw it through, as if you were going to tie a knot in the usual way. Again throw the right-hand end over the left, and give the left-hand end to some person to pull, you at the same time pulling the right-hand end with your



handkerchief decreasing considerably in length, while the left-hand one remains nearly as long as at first; because, in fact, you are merely tying the right-hand end round the left. To prevent this from being noticed, you should stoop down a little after each knot, and pretend to pull the knots tighter; while, at the same time, you press the thumb of the right hand against the knot, and with the fingers and palm of the same hand, draw the handkerchief, so as to make the left-hand end shorter, keeping it at each knot as nearly the length of the right-hand end as possible.

When you have tied as many knots as the handkerchief will admit of, hand them round for the company to feel that they are firm knots; then hold the handkerchief in your right hand, just below the knots, and with the left hand turn the loose part of the centre of the handkerchief over them, desiring some person to hold them. Before they take the handkerchief in hand, you draw out the right-hand end of the handkerchief, which you have in the right hand, and which you may easily do, and the knots being still held together by the loose part of the handkerchief, the person holding the handkerchief will declare he feels them; you then take hold of one of the ends of the handkerchief which hangs down, and desire him to repeat after you, one—two—three,—then tell him to let go, when, by giving the handkerchief a smart shake, the whole of the knots will become unloosed.

Should you, by accident, while tying the knots, give the wrong end to be pulled, a hard knot will be the consequence, and you will know when this has happened the instant you try to draw the left-hand end of the handkerchief shorter. You must, therefore, turn this mistake to the best advantage, by asking any one of the company to see how long it will take him to untie one knot, you counting the seconds. When he has untied the knot,



your other knots will remain right as they were before. Having finished tying the knots, let the same person hold them, and tell him that as he took two minutes to untie one knot, he ought to allow you fourteen minutes to untie the seven; but as you do not wish to take any advantage, you will be satisfied with fourteen seconds.

You may excite some laughter during the performance of this trick by going to the owner of the handkerchief, and desiring him to assist you in pulling a knot, saying, that if the handkerchief is to be torn, it is only right that he should have a share of it; you may likewise say that he does not pull very hard, which will cause a laugh against him.

THE INVISIBLE SPRINGS.

Take two pieces of white cotton cord, precisely alike in length; double each of them separately, so that their ends meet; then tie them together very neatly, with a bit of fine cotton thread, at the part where they double, (*i. e.* the middle.) This must all be done beforehand.

When you are about to exhibit the sleights, hand round two other pieces of cord, exactly similar in length and appearance to those which you have prepared, but not tied, and desire your company to examine them. You then return to your table, placing these cords at the edge, so that they fall (apparently



purpose. When the rings have undergone a sufficient scrutiny, pass the prepared double cords through them, and give the two ends of one cord to one person to hold, and the two ends of the other to another. Do not let them pull hard, or the thread will break, and your trick be discovered. Request the two persons to approach each other, and desire each to give you one end of the cord which he holds, leaving to him the choice. You then say, that, to make all fast, you will tie those two ends together, which you do, bringing the knot down so as to touch the rings; and returning to each person the end of the cord next to him, you state that this trick is performed by the rule of contrary, and that when you desire them to pull hard, they are to slacken, and *vice versa*, which is likely to create much laughter, as they are certain of making many mistakes at first.

During this time, you are holding the rings on the forefinger of each hand, and with the other fingers preventing your assistants from separating the cords prematurely, during their mistakes; you at length desire them, in a loud voice, to slacken, when they will pull hard, which will break the thread, the rings remaining in your hands, whilst the strings will remain unbroken: let them be again examined, and desire them to look for the springs in the rings.

THE MIRACULOUS APPLE.

To divide an apple into several parts, without breaking the rind:—Pass a needle and thread under the rind of the apple, which is easily done by putting the needle in again at the same hole it came out of; and so passing on till you have gone round the apple. Then take both ends of the thread in your hands and draw it out; by which means the apple will be divided into two parts. In the same manner, you may divide it into as many

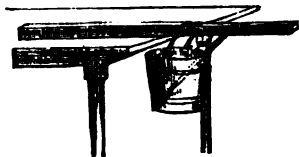


parts as you please, and yet the rind will remain entire Present the apple to any one to peel, and it will immediately fall to pieces.

THE SELF-BALANCED PAIL.

You lay a stick across the table, letting one-third of it project over the edge; and you undertake to hang a pail of water on it, without either fastening the stick on the table, or letting the pail rest on any support; and this feat the laws of gravitation will enable you literally to accomplish.

You take the pail of water, and hang it by the handle upon the projecting end of the stick, in such a manner that the handle may rest on it in an inclined position, with the middle of the pail within the edge of the table. That it may be



fixed in this situation, place another stick with one of its ends resting against the side at the bottom of the pail, and its other end against the first stick, where there should be a notch to retain it. By these means, the pail will remain fixed in that situation, without being able to incline to either side; nor can the stick slide along the table, or move along its edge, without raising the centre of gravity of the pail and the water it contains.

THE PHANTOM AT COMMAND.

This feat is performed by means of confidence. The



door locked upon him, perhaps the animal may appear to him which another person may name.

In order to deter every one except your confederate from accepting the offer, you announce at the same time, that the person who volunteers to be shut up in the room must be possessed of considerable courage, or he had better not undertake it. Having thus gained your end, you give your confederate a lamp which burns with a very dismal light; telling him, in the hearing of the company, to place it on the middle of the floor, and not to feel alarmed at what he may happen to see. You then usher him into the room, and lock the door.

You next take a piece of black paper, and a bit of chalk, and giving them to one of the party, you tell him to write the name of any animal he wishes to appear to the person shut up in the room. This being done, you receive back the paper, and after showing it round to the company, you fold it up, burn it in the candle, or lamp, and throw the ashes into a mortar; casting in at the same time a powder, which you state to be possessed of valuable properties.

Having taken care to read what was written, you proceed to pound the ashes in the mortar thus:—Suppose the word written to be CAT, you begin by stirring the pestle round the mortar several times, and then strike three distinct blows, loud enough for the confederate to hear, and by which he knows that the first letter of the word is C. You next make some irregular evolutions of the pestle round the mortar, that it may not appear to the company that you give nothing but blows, and you then



as possible. You then call aloud to your confederate, and ask him what he sees. At first he is to make no reply. At length, after being interrogated several times, he asks if it be a CAT.

That no mistake may be made, each party should repeat to himself the letters of the alphabet in the order of the blows.

THE MIRACULOUS SHILLING.

Provide a round box, the size of a large snuff-box, and likewise eight other boxes, which will go easily into each other, letting the least of them be of the size to hold a shilling. Observe that all these boxes must shut so freely that they may all be closed at once, by the covers accurately fitting within each other.

Previously to commencing your performance, fit the boxes within each other, and place them in a table drawer at another part of the room. You also fit the covers in the same manner, and lay them by the side of the boxes; you likewise provide a silk handkerchief, into one corner of which a shilling is sewed.

You now commence your operations by borrowing a shilling, desiring the lender to mark it, that it may not be changed. Take this shilling in your right hand, and the handkerchief in your left, pretending to place the shilling in the centre of the handkerchief; instead of which, you put the corner of the handker-



Having thus closed your boxes, you produce what appears to be a single box, and lay it on the table. You now ask the person, who still retains his hold of the shilling in the handkerchief, if he is sure that it is there. He will reply in the affirmative: you then request him to allow you to take the handkerchief; and, having done so, you strike that part of the handkerchief containing the shilling on the box, and immediately shake out the handkerchief, holding it by two corners, and shifting it round so as to get the shilling within your grasp: it will thus appear that the shilling is no longer there. You desire the person to open the box, and hand it round, till the shilling be found; and when the last box is opened, and the shilling taken out, you ask the lender to state whether it is the one which he marked; to which he must, of course, reply in the affirmative.

THE LOCOMOTIVE SHILLING.

Privately place a shilling, which you previously mark on the head side with a cross, under a candlestick, or in any other out-of-the-way situation, where it is not likely to be discovered. You next borrow a shilling of one of the company, and say, "Now I am going to show you a trick with this shilling, but that you may know it again, I will mark it." Then take your penknife, and cross it in the same manner as the one you have concealed; show it to the person who lent it to you, and ask him if he will know it again. He will reply, "Yes; it is marked with a cross." Knock under the table, and say, "Presto! fly quickly!" at the same time adroitly conveying the shilling into your pocket. You then tell the spectators that it is gone; but you have a strong notion that if they look they will find it under the candlestick, (or whatever other place you may have concealed it in,) where the first shilling you marked will of course be found, and having the same marks as the genuine one, will be mistaken for it.



THE PENETRATIVE SIXPENCE.

You profess that you will make a sixpence appear to pass through the table. To perform this feat, you must have a handkerchief, in one corner of which is sewed a sixpence. Take it out of your pocket, and ask one of the company to lend you a sixpence, which you must seem to carefully wrap up in the middle of the handkerchief, but instead of which, you keep it in the palm of your hand, and in its stead, wrap up the corner in which the other sixpence is sewed in the midst of the handkerchief, and bid the person from whom you borrowed the sixpence feel that it is there. You then lay it under a hat upon the table, take a glass in the hand in which you have concealed the sixpence, and hold it under the table. Give three knocks upon the table, crying, "Presto! come quickly!" Then drop the sixpence into the glass; bring the glass from under the table, and exhibit the sixpence to the spectators. You lastly take the handkerchief from under the hat, and shake it, taking care to hold it by the corner in which the sixpence was sewed.

THE VANISHING SIXPENCE.

Having previously stuck a small piece of white wax upon the nail of your middle finger, lay a sixpence on the palm of your



vanished. If you borrow the sixpence of any of the company, take care to rub off the wax before you restore it to the owner.

TO MAKE A SIXPENCE BALANCE AND SPIN ON ITS EDGE, ON THE POINT OF A NEEDLE.

Procure a common wine bottle, two forks, two corks, a needle, a sixpence, and a penknife. Having corked the bottle, force the eye of the needle into the cork perpendicularly, leaving more than half the needle sticking up. You next cut a small slit with the penknife in the centre of the bottom of the second cork, into which you insert the sixpence edgewise; then stick the forks into the upper cork, and, with a steady hand, place the edge of the sixpence on the point of the needle, and it will immediately find its balance. You may now take the upper cork between the finger and thumb, and spin it round as fast as you please, as the sixpence will not fall off. When it goes slow, hit one of the forks with your finger as it goes round, to increase its velocity.

THE MULTIPLYING COIN.

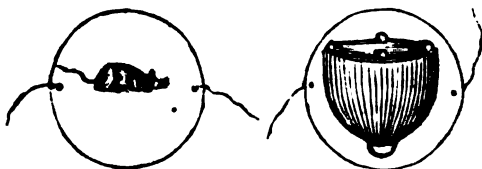
Let a tumbler be half-filled with water; put a sixpence in it, and, holding a plate over the top, turn the glass upside down. The sixpence will fall down on the plate, and appear to be a shilling; while at the same time a sixpence will seem to be swimming in the water. If a shilling is put in the glass, it will have the appearance of a quarter of a dollar and a shilling; and if a quarter of a dollar were put in, it would seem to be half a dollar and a quarter of a dollar.

MAGIC RAT TRAP.

Prepare a pasteboard circle, upon one side of which draw a figure of a cage, and on the other side that of a rat. Nea



the outer edge of the circle fasten two strings opposite each other, so that they may be held between the forefinger and thumb in such manner that the circle may be made to revolve rapidly.



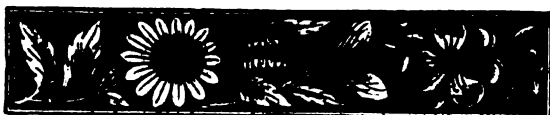
When it is set in motion the transition is so quick, that it presents the appearance of a rat in a cage.

TO SHOW THE VELOCITY OF MOTION.

Take a long hollow stalk or reed, suspend it horizontally by two loops of single hairs; by striking it with a sharp quick stroke at a point nearly in the centre, between the hairs, it may be cut through without breaking either of them. The hairs in this case would have been ruptured if they had partaken of the force applied to the stalk; but the division of the latter being effected before the impulse could be propagated to the hairs, they must consequently remain unbroken.

A smart blow with a slight wand or hollow reed on the edge of a glass tumbler, would break the wand, without injury to the glass.

Lay a small piece of money upon a card placed over the mouth of a glass tumbler, and resting upon the rim of the glass. The card may be withdrawn with such speed and dexterity that the piece of money will not be removed laterally, but will drop into the glass.



THE EXPLODING BUBBLE.

If you take up a small quantity of melted glass with a tube, (the bowl of a common tobacco-pipe will do,) and let a drop fall into a vessel of water, it will chill and condense with a fine spiral tail, which being broken, the whole substance will burst with a loud explosion, without injury either to the party that holds it, or him that breaks it; but if the *thick* end is struck even with a hammer, it will not break.

THE MAGIC PICTURE.

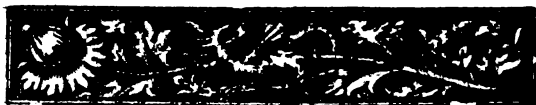
Take two level pieces of glass, (plate glass is the best,) about three inches long and four wide, exactly of the same size; lay one on the other, and manage to leave a space between them, by pasting a piece of card, or two or three small pieces of thick paper, at each corner.

Join these glasses together at the edge by a composition of lime slacked by exposure to the air, and white of an egg. Cover all the edges of these glasses with parchment or bladder, except at one end, which is to be left open to admit the following composition:

Dissolve by a slow fire six ounces of hog's lard with half an ounce of white wax; to which you may add an ounce of clear linseed oil.

This must be poured in its liquid state, and before a fire, between the glasses, by the space left in the sides, and which you are then to close up. Wipe the glasses clean, and hold them before the fire, to see that the composition will not run out at any part.

Then fasten with gum a picture or print, painted on very thin



paper, with its face to one of the glasses, and, if you like, you may fix the whole in a frame.

While the mixture between the glasses is cold, the picture will be quite concealed, but become transparent when held to the fire; and as the composition cools, it will gradually disappear.

ARTIFICIAL LIGHTNING.

Provide a tin tube that is larger at one end than it is at the other, and in which there are several holes. Fill this tube with powdered resin; and when it is shook over the flame of a torch, the reflection will produce the exact appearance of lightning.

THREE OBJECTS DISCERNIBLE ONLY WITH BOTH EYES.

If you fix three pieces of paper against the wall of a room at equal distances, at the height of your eye, placing yourself directly before them, at a few yards' distance, and close your right eye, and look at them with your left, you will see only two of them, suppose the first and second; alter the position of your eye, and you will see the first and third; alter your position a second time, you will see the second and third, but never the whole three together; by which it appears that a person who has only one eye can never see three objects placed in this manner.



hour to that at which he intends to rise, and including the hour at which he has placed the hand; which will give the answer. For example,

A intends to rise at 6; (this he conceals to himself;) he places the hand at 8, which he tells B, who, in his own mind, adds 12 to 8, which make 20. B then tells A to count 20 on the dial, beginning at the next hour to that at which he proposes to rise; which will be 7; and counting backwards, reckoning each hour as 1, and including in his addition the number of the hour the hand is placed at, the addition will end at 6, which is the hour proposed: thus,

The hour the hand is placed at is 8

The next hour to that which A intends to rise at is 7, which counts for 1

Count back the hours from 6, and reckon them at 1 each, there will be 11 hours, viz. 4, 3, 2, 1, 12, 11, 10, 9, 8, 7, 6, 11

Making 20

TO MAKE A RING SUSPEND BY A THREAD, AFTER THE THREAD HAS BEEN BURNED.

Soak a piece of thread in urine, or common salt and water. Tie it to a ring, not larger than a wedding ring. When you apply the flame of a candle to it, it will burn to ashes, but yet sustain the ring

TO MELT A PIECE OF MONEY IN A WALNUT SHELL WITHOUT



one part of flowers of sulphur, and a little saw-dust well sifted. If you then set light to the mixture, you will find, when it is melted, that the metal will also be melted in the bottom of the shell, in form of a button, which will become hard when the burning matter round it is consumed; the shell will have sustained very little injury.

THE MAGICAL MIRRORS.

Make two holes in the wainscot of a room, each a foot high and ten inches wide, and about a foot distant from each other. Let these apertures be about the height of a man's head, and in each of them place a transparent glass in a frame, like a common mirror.

Behind the partition, and directly facing each aperture, place two mirrors, inclosed in the wainscot, in an angle of forty-five degrees.* These mirrors are each to be eighteen inches square: and all the space between them must be inclosed with pasteboard painted black, and well closed, that no light can enter; let there be also two curtains to cover them, which you may draw aside at pleasure.

When a person looks into one of these fictitious mirrors, instead



sides of the persons who look in them, or the experiment will not have so remarkable an effect.

THE ENCHANTED BOTTLE.

Fill a glass bottle with water to the beginning of the neck; leave the neck empty, and cork it. Suspend this bottle opposite a concave mirror, and beyond its focus, that it may appear reversed. Place yourself still further distant from the bottle; and instead of the water appearing, as it really is, at the bottom of the bottle, the bottom will be empty, and the water seen at the top.

If the bottle be suspended with the neck downwards, it will be reflected in its natural position, with the water at the bottom, although in reality it is inverted and fills the neck, leaving the bottom vacant. While the bottle is in this position, uncork it, and let the water run gradually out: it will appear that while the real bottle is emptying, the reflected one is filling. Care must be taken that the bottle is not more than half or three parts full, and that no other liquid is used but water; as in either of these cases the illusion ceases.

THE ARMED APPARITION.

If a person with a drawn sword place himself before a large concave mirror, but further from it than its focus, he will see an inverted image of himself in the air, between him and the mirror, of a less size than himself. If he steadily present the sword towards the centre of the mirror, an image of the sword will come out from it, point to point, as if to fence with him; and by his pushing the sword nearer, the image will appear to come nearer to him, and almost to touch his breast. If the mirror be



turned 45 degrees, or one-eighth round, the reflected image will go out perpendicular to the direction of the sword presented, and apparently come to another person placed in the direction of the motion of the image, who, if he be unacquainted with the experiment, and does not see the original sword, will be much surprised and alarmed.

**TO EXTRACT THE SILVER OUT OF A RING THAT IS THICKLY GILDED,
SO THAT THE GOLD MAY REMAIN ENTIRE.**

Take a silver ring that is thickly gilded. Make a little hole through the gold into the silver; then put the ring into aquafortis, in a warm place: it will dissolve the silver, and the gold will remain whole.

CURIOUS EXPERIMENT WITH A GLASS OF WATER.

Saturate a certain quantity of water, in a moderate heat, with three ounces of sugar; and when it will no longer receive that, there is still room in it for two ounces of salt of tartar, and after that for an ounce and a drachm of green vitriol, nearly six drachms of nitre, the same of salammoniac, two drachms and a scruple of alum, and a drachm and a half of borax.

**A LUMINOUS BOTTLE, WHICH WILL SHOW THE HOUR ON A WATCH
IN THE DARK.**



on removing the stopper: it will instantly
and weather the bottle should be warmed in the
the stopper is removed. A phial thus prepared may
night for six months.

RUSES.

THE WONDERFUL HAT.

Place three pieces of bread, or other eatable, at a little distance from each other on a table, and cover each with a hat; you then take up the first hat, and removing the bread, put it into your mouth, and let your company see that you swallow it; then raise the second hat, and eat the bread which was under that, and do the same with the third. Having eaten the three pieces, give any person in company liberty to choose under which hat he would wish those three pieces of bread to be; when he has made choice of one of the hats, put it on your head, and ask him if he does not think that they are under it.

TO BRING A PERSON DOWN UPON A FEATHER.

This is a practical pun:—You desire any one to stand on a chair or table, and you tell him that, notwithstanding his weight, you will bring him down upon a feather. You then leave the room, and procuring a feather from a feather-bed, you give it to him, and tell him you have performed your promise,—that you engaged to bring him *down* upon a feather, which you have done for there is the feather, and, if he looks, he'll find *down* upon it.



THE APPARENT IMPOSSIBILITY.

You profess yourself able to show anyone what he never saw what you never saw, and what nobody else ever saw, and which, after you two have seen, nobody else ever shall see.

After requesting the company to guess this riddle, and they have professed themselves unable to do so, produce a nut, and having cracked it, take out the kernel, and ask them if they have ever seen that before; they will of course answer, No; you reply, neither have I, and I think you will confess that nobody else has ever seen it, and now no one shall ever see it again; saying which, you put the kernel into your mouth and eat it.

AN OMELET COOKED IN A HAT, OVER THE FLAME OF A CANDLE.

You ask the company if they would like an omelet cooked; then you break four eggs in a hat, place the hat for a short time over the flame of a candle, and shortly after produce an omelet, completely cooked, and quite hot.

Some persons would be credulous enough to believe that by the help of certain ingredients you had been enabled to cook the omelet without fire; but the secret of the trick is, that the omelet had been previously cooked and placed in the hat, but could not be seen, because the operator, when breaking the eggs, placed it too high for the spectators to observe the contents. The eggs were empty ones, the contents having been previously extracted, by being sucked through a small aperture, but to prevent the company from suspecting this, the operator manages, as if by accident, to let a full one fall on the table, which breaking induces a belief that the others are also full.

**THE IMPOSSIBLE OMELET.**

You produce some butter, eggs, and other ingredients for making an omelet, together with a frying-pan, in a room where there is a fire, and state that the cleverest cook will not be able to make an omelet with them. The wager is won by having previously caused the eggs to be boiled very hard.

SO IF YOU CAN.

You tell a person that you will clasp his hands together in such a manner that he shall not be able to leave the room without unclasping them, although you will not confine his feet or bend his body, or in any way oppose his exit.

The trick is performed by clasping the party's hands round the pillar of a large circular table or other bulky article of furniture, too large for him to drag through the doorway.

THE FIGURE PUZZLE.

IX You assert that you can prove the half of nine to be either
XII four or six; and the half of twelve to be seven. To
make this manifest you have only to draw a nine or a
twelve in numerals, and fold the paper across the middle, as in the margin.

THE VISIBLE INVISIBLE.

You tell the company that you will place a candle in such a manner, that every person in the room except one, shall see it: yet you will not blindfold him, nor in any way restrain his person, or offer the least impediment to his examining or going



to any part of the room he pleases. This trick is accomplished by placing the candle on the party's head; but it cannot be performed if a looking-glass is in the room, as that will enable him to turn the laugh against you.

THE DOUBLE MEANING.

Place a glass of any liquid upon the table, put a hat over it, and say: "I will engage to drink the liquid under that hat, and yet I'll not touch the hat." You then get under the table, and after giving three knocks, you make a noise with your mouth as if you were swallowing the liquid. Then getting from under the table, you say: "Now, gentlemen, be pleased to look." Some one, eager to see if you have drunk the liquid, will raise up the hat, when you instantly take the glass, and drink the contents, saying: "Gentlemen, I have fulfilled my promise. You are all witnesses that I did not touch the hat."

QUITE TIRED OUT.

You undertake to make a person so tired, by attempting to carry a small stick out of the room, as to be unable to accomplish it, although you will add nothing to his burthen, nor lay any restraint upon his personal liberty. To perform this manoeuvre, you take up the stick, and cutting off a very small sliver, you direct him to carry it out of the room, and return for more; con-



—something, in fact, *quite out of the common*. Having thus excited his curiosity, you produce the stick or stone, or whatever else you may have picked up, which of course he will examine very intently, and at length observe, that he sees nothing extraordinary in it. “That may be,” you reply, “and yet, I assure you, that it is really something out of the common.” This will, no doubt, set him upon a fresh examination, which will naturally end in his asking for an explanation. This you give, by telling him that “though not *uncommon*, it is *out of the common*, for it is *out of—Common*,” and no doubt, the company present will indulge in a hearty laugh at the querist’s expense.

TO RUB ONE SIXPENCE INTO TWO.

Previously wet a sixpence slightly, and stick it to the under edge of a table, (without a cover,) at the place where you are sitting. You then borrow a sixpence from one of the company, and tucking up your sleeves very high, and opening your fingers, to show that you have not another concealed, rub it quickly backwards and forwards on the table with your right hand, holding your left under the edge of the table to catch it. After two or three feigned unsuccessful attempts to accomplish your object, you loosen the concealed sixpence with the tips of the fingers of the left hand, at the same time that you are sweeping the borrowed sixpence into it; and rubbing them a little while together in your hands, you throw them both on the table.

MAGIC CIRCLE.

You tell a person you will place him in the centre of a room, and draw a circle of chalk round him, which shall not exceed three feet in diameter, yet out of which he shall not be able to



cap. though his legs shall be perfectly free. When the party has exhausted his ingenuity in trying to discover by what means you can prevent his accomplishing so seemingly easy a task, you ask him if he will try; and on his assenting, you bring him into the middle of the room, and having requested him to button his coat tightly, you draw, with a piece of chalk, a circle round his waist, outside his coat, and tell him to jump out of it.

It will greatly improve this trick if the person be blindfolded, as he will not be aware of the mode of performing it till the bandage is removed, provided his attention be diverted while you are drawing the line round him.





ILLUSIONS OF TOUCH.

APPLY the points of a pair of compasses, distant from each other one or two lines, to the cheek, just before the ear; then move them successively to several other parts of the cheek, and you will find, on approaching the mouth, that the points will appear to recede from each other; this effect being produced by the great difference of the sense of touch in these parts. It is a general law, that in the more sensitive portions of the skin, any two points appear to be further asunder from each other than points of equal distance appear to be to a less sensitive portion. The same experiments may be made by holding together the extremities of the forefinger and thumb, and then passing the tips of both in a line from the ear to either the upper or the under lip; as they approach the latter, they will feel to the cheek as if they were becoming more and more distant from each other.

If the skin be touched with the points of a pair of compasses one inch asunder, the person so touched, while he shuts his eyes,



will instantly be aware that his skin is touched in two places but by continually drawing the two points closer, a degree of nearness may be reached at which the person will imagine his skin to be touched by only one body ; he will, however, describe this body, or the compasses, to be a little longer in one direction than another ; and it appears that this difference of length corresponds with the distance between the two points of the compasses. When these points are brought still nearer together, the 'nequality will no longer be felt, and the person will fancy he is being touched by one body only.

Handle a pea : it is *one*—place it between the first and second fingers of the right hand, in their natural position, and you will still feel the pea but as *one*. Then cross the two fingers, bringing the second over the first, and place the pea in the fork between them, so as to feel the left side of the pea with the right side of the second finger, and the right with the left of the first. The impression will then be that you have *two* peas touching the fingers, especially if the eyes be shut, and the fingers be placed by another person. The illusion will be equally strong if the two forefingers of both hands be crossed, and the pea placed between them.

ILLUSION OF THE TASTE.



very white, but very rotten, slitting and dropping into holes upon the slightest touch.

The dazzling whiteness of paper is caused by bleaching it with chloride of lime. Thus, if you write on printing paper with common ink, it will fade, because the chloride will destroy the colouring matter of writing ink. It will not, however, change printing ink, as that owes its blackness to charcoal, which is a singularly permanent substance. Blot over a printed page with common writing ink, wash it with chloride of lime, when the blots will disappear, and leave the printing unchanged.

INFLUENCE OF COLOURED GLASS ON BULBOUS ROOTS.

Put a bulb, as a hyacinth, narcissus, &c., into a white glass, and another into a purple glass: the latter will grow faster than the former; and if a pinch of salt, or a piece of nitre, be put into the water whenever it is changed, the brightness of the colour of the flower will be considerably heightened.

THE SPINNING-TOP "ASLEEP."

Spin a top, and it will for some time stand "asleep," as it is called in the parlance of the play-ground. The cause is thus explained by Dr. Arnot, in his valuable *Elements of Physics*: "While the top is perfectly upright, its point being directly under its centre, supports it steadily, and although turning so rapidly, has no tendency to move from the place; but if the top incline at all, the *side* of the peg, instead of the very *point*, comes in contact with the floor, and the peg then becomes a little wheel or roller, advancing quickly, and, with its touching



edge, describing a curve somewhat as a skater does, until it becomes directly under the body of the top, as before. It thus appears that the very fact of the top inclining causes the point to shift its place, so that it cannot rest until it come again directly under the centre of the top."

TO JUDGE OF WEIGHTS.

Persons accustomed to estimate weights by poising them in their hands, will distinguish perfectly between two, only differing by a thirtieth part. In comparing two weights, poise one and then instantly the other *in the same hand*; the few seconds of time that pass between the poising of the two weights will not prevent their accurate comparison. The interval may amount to twenty seconds, yet a just estimate may still be made; but when it amounts to forty seconds, all accuracy will be lost.

QUICKSILVER AND OIL UNITED.

Let fall a very small drop of oil upon a large drop of mercury and the latter will become enlarged. This phenomenon is attributed to a combination of the oil with the mercury, which produces a compound, the attraction of which is less strong than that of pure mercury.

TO DISSOLVE THE SODA IN GLASS.



MELANGE.

179

Or, moisten with water a piece of tumeric, or test-paper, drop on it a little powdered glass, and the soda in it will change the yellow paper to brown.

WATERPROOF PAPER.

Make a solution of caoutchouc in caoutchoucine, plunge into it, once or twice, unsized paper, and dry it by a gentle heat. It may then be used as writing paper, and will resist all humidity; and small vessels made of it will even contain water.

TO DISSOLVE GOLD OR PLATINUM.

Mix a little nitric acid with half the quantity of muriatic acid, into which put the metal for solution.

Or, pour a little aqueous solution of chlorine into a small glass, and put in a bit of pure gold leaf; stir it with a glass rod, and the gold will dissolve. Thus gold, which cannot be dissolved in nitric, sulphuric, or other strong acids, will quickly disappear in water with a little chlorine in solution.

COLDER THAN ICE.

Mix common salt with pounded ice or snow, and they will run into brine, which will be much colder than the ice or snow.

CONTRA-CRYSTALLIZATION.

Dissolve two ounces of nitre and three of Glauber salts in five ounces of warm water; fill two bottles with the solution, into one of which put a crystal of nitre, and into the other a crystal of Glauber salts; place both bottles in ice-cold water, when nitre only will crystallize in the one and Glauber salts in the other.

**ONE AND ONE DO NOT MAKE TWO.**

Mix a wine-glass full of sulphuric acid with a wine-glass full of water, cautiously; and on remeasuring the mixture it will not be found sufficient to refill both glasses.

TO COPY WRITING INSTANTLY.

Add a little sugar to ink, with which write the letter to be copied; then lay a sheet of thin unsized paper, damped with a sponge, on the writing; pass lightly over it a flat-iron, very moderately heated, and a reverse impression of the writing will be accurately taken off.

THE RIVAL DIALS.

Fix two pendulum clocks to the same wall, or lay two watches upon the same table, and they will take the same rate of going, though they would vary in that rate if they were placed in separate apartments. Indeed, it has been observed that the pendulum of one clock will even stop that of the other, and that the stopped pendulum will, after a certain time, go again, and in its turn stop the other pendulum.

TO SPIN INDIAN RUBBER.

Take a small piece of Indian rubber, and cut it into a thin slice.



MELANGE.

175

INDELIBLE WRITING.

As the art of man can unmake whatever his ingenuity can make, we have no right to expect an indelible ink; however, an approximation to it may be made as follows: Make a saturated solution of indigo and madder in boiling water, in such proportions as to give a purple tint; add to it from one-sixth to one-eighth of its weight of sulphuric acid, according to the thickness and strength of the paper to be used. Write with this ink, and expose the paper to a gradual heat from the fire, when the characters will be completely black, the letters being burnt in and charred by the sulphuric acid. If the acid has not been used in sufficient quantity to destroy the texture of the paper, and reduce it to the state of tinder, the colour may be discharged by washing it with a strong solution of oxalic acid in water. When the full proportion of acid has been employed, crumple and rub the paper, and the charred letters will fall out; then, by placing a black ground behind the letters, they may be preserved, and thus a species of indelible writing may be procured, the letters being, as it were, stamped out of the paper.

VEGETABLE ANATOMY.

Soak any part of a plant in nitric acid for a short space of time, and all power of cohesion will be lost by the vessels, which will become transparent, and be easily separable from each other by



TO TELL WHAT O'CLOCK IT IS BY THE MOON.

This may be calculated by the shadow which the moon casts upon a sun-dial, it being only necessary to know the moon's age, which may be found in an almanac. If the new moon happens in the morning, this day is taken into the account; but if it happens after noon, the following day is counted the first. The moon's age is to be multiplied by four and divided by five. The quotient must either be added to the hour which the shadow indicates on the sun-dial, and the sum will give the time sought; or subtract from the quotient the hour shown by the moon upon the dial, and the remainder will give the hour sought. The first is to be done when the shadow falls upon an hour of the afternoon, and the latter when it falls upon an hour of the forenoon. The following are examples:

1st. Suppose the moon to be ten days old, and the shade cast by the moon upon the sun-dial to be at half-past two; or, that the shadow cast by the moon falls on the place at which the shadow cast by the sun stands at half-past two;—what o'clock was it then? The answer is calculated as follows:—The moon's age, 10 days $\times 4 = 40$ $\div 5 = 8$. Eight, therefore, is the time when the moon was in the meridian, and $8 + 2\frac{1}{2} = 10\frac{1}{2}$, or half-past ten, the hour sought.

2d. Suppose the moon to have been 18 days old, and the shadow cast by it on the sun-dial to have marked eleven. This time is subtracted from the time when the moon was in the



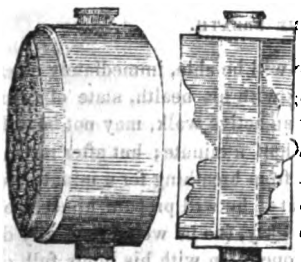
MELANGE.

175

THE PHYSIOGNOTYPE.

This is a newly invented instrument, by the aid of which a person may have a plaster cast of his face taken without submitting to the usual unpleasant process.

It consists of an assemblage of very fine movable wires, confined closely together within a broad hoop or band, after the manner of the bristles in a telescope hearth-brush, but not closed at the back, in order to allow to the wires a free passage. The wires slide in a metal plate, perforated all over with holes, very fine and close together. The apparatus is surrounded by an outer case which is filled with warm water, in order to prevent any unpleasant sensation on the contact of the instrument with the skin.



When it is desired to take a likeness, the instrument is applied to the face with a gentle and gradual pressure, the wires easily yield and slide back, conformably to the prominences of the countenance; they are then fixed tightly in their position, and thus form a mould which will yield a perfect and faithful cast of the face, in which even the most minute line will appear with the strictest accuracy.

INFINITE DIVISIBILITY OF MATTER.

Dissolve a single grain of copper in about one drachm of nitric acid, and dilute the solution with about one ounce of water, when



It will be evident that a single drop of the mixture must contain an almost immeasurably small portion of copper. Yet, if the blade of a knife be dipped into it, it will become covered with a coat of copper; thus showing that the copper can be infinitely divided without any alteration in its properties.

HOLDING THE BREATH.

If a person inspire deeply, he will be able, immediately after, to hold breath for a time, varying with his health, state of exertion, or repose. A man, during an active walk, may not be able to cease breathing for more than half a minute; but after resting on a chair or bed, he may refrain from breathing for a minute and a half, or even two minutes. But if he will prepare himself by breathing deeply, hardly, and quickly, (as he would naturally do after running,) and ceasing that operation with his lungs full of air, then hold his breath as long as he is able, he will find that the time during which he can remain without breathing will be double, or even more than double the former. This effect may be rendered exceedingly serviceable, as on many occasions a man who can hold breath for a minute, or two minutes, may save the life of another; such as in entering a chamber on fire, rescuing from drowning, &c.

SAND IN THE HOUR-GLASS.

It is a remarkable fact, that the flow of sand in the hour-glass



be more swiftly urged through the aperture than when the glass was only a quarter full, and near the close of the hour.

The fact of the even flow of sand may be proved by a very simple experiment. Provide some silver sand, dry it over or before the fire, and pass it through a tolerably fine sieve. Then take a tube, of any length or diameter, closed at one end, in which make a small hole, say the eighth of an inch; stop this with a peg, and fill up the tube with the sifted sand. Hold the tube steadily, or fix it to a wall or frame, at any height from a table; remove the peg, and permit the sand to flow in any measure for any given time, and note the quantity. Then let the tube be emptied, and only half or a quarter filled with sand; measure again, for a like time, and the same quantity of sand will flow: even if you press the sand in the tube with a ruler or stick, the flow of the sand through the hole will not be increased.

The above is explained by the fact, that when the sand is poured into the tube, it fills it with a succession of conical heaps, and that all the weight which the bottom of the tube sustains, is only that of the heap which *first* falls upon it; as the succeeding heaps do not press downward, but only against the sides or walls of the tube.

RESISTANCE OF SAND.

From the above experiment it may be concluded, that it is extremely difficult to thrust sand out of a tube by means of a fitting plug or piston; and this, upon trial, is found to be the case. Fit a piston to a tube, (exactly like a boy's pop-gun,) pour some sand in, and try with the utmost strength of the arm to push out the sand. It will be found impossible to do this



rather than the sand should be shot out, the tube will burst at the sides.

GLASS BROKEN BY SAND.

If bullets be let fall on glass which has been cooled in the open air, they will not break it; but if a few grains of sand be let fall on the same kind of glass, it will be broken into a thousand pieces! This is explained by the lead not scratching the surface of the glass; whereas the sand, being sharp and angular, scratches sufficiently to break it.

TO BLEACH IVORY.

Place any piece of discoloured ivory beneath a glass, expose it to the sun, and it will soon be restored to pure whiteness; whereas, if the ivory be exposed to the sun without the glass covering, it will become more discoloured.

VANISHING SHELLS.

Put into a little diluted muriatic acid a common whelk shell, when it will be completely dissolved, and not a sensible trace of it left behind.

If an oyster shell or land-snail shell be put into the acid, their substances will disappear, but the form or skeleton of the shells will remain.



the whole egg will slowly rotate. This rotation is formed by the bubbles of gas forming at the under part of the egg, and over all the submersed portions, which render them lighter than the portions above the liquid level, till the under portion ascends and the other descends.

THE MAGIC WHIRLPOOL.

Fill a glass tumbler with water, throw upon its surface a few fragments or thin shavings of camphor, and they will instantly begin to move and acquire a motion both progressive and rotatory, which will continue for a considerable time. During these rotations, if the water be touched by any substance which is at all greasy, the floating particles will quickly dart back, and, as if by a stroke of magic, be instantly deprived of their motion and vivacity.

In like manner, if thin slices of cork be steeped in sulphuric ether in a closed bottle, for two or three days, and then placed upon the water, they will rotate for several minutes, like the camphor; until the slices of cork having discharged all their ether, and become soaked with water, they will keep at rest.

If the water be made hot, the motion of the camphor will be more rapid than in cold water, but it will cease in proportionately less time. Thus, provide two glasses, one containing water at 58 degrees, and the other at 210 degrees; place raspings of camphor upon each at the same time; the camphor in the first glass will rotate for about five hours, until all but a very minute portion has evaporated, while the rotation of the camphor in the hot water will last only nineteen minutes; about half the camphor will pass off and the remaining pieces, instead of being dull, white, and



opaque, will be vitreous and transparent, and evidently soaked with water. The gyrations, too, which at first will be very rapid, will gradually decline in velocity, until they become quite sluggish.

The stilling influence of oil upon waves has become proverbial: the extraordinary manner in which a small quantity of oil instantly spreads over a very large surface of troubled water, and the stealthy manner in which even a rough wind glides over it, must have excited the admiration of all who have witnessed it.

By the same principle, a drop of oil may be made to stop the motion of the camphor, as follows: throw some camphor, both in slices and in small particles, upon the surface of water, and while they are rotating dip a glass rod into oil of turpentine, and allow a single drop thereof to trickle down the inner side of the glass to the surface of the water; the camphor will instantly dart to the opposite point of the liquid surface, and cease to rotate. If a piece of hard tallow or lard be employed, the motion of the camphor will be more slowly stopped than by oil or fluid grease, as the latter spreads over the surface of the water with greater rapidity.

If a few drops of sulphuric or muriatic acid be let fall into the water, they will gradually stop the motion of the camphor; but, if camphor be dropped into nitric acid diluted with its own bulk of water, it will rotate rapidly for a few seconds and then stop.

If a piece of the rotating camphor be attentively examined with a lens, the currents of the water can be well distinguished, jetting out chiefly from the corners of the camphor, and bearing



MELANGE.

183

upon a slip of glass, with a particle of camphor floating upon it. By this means the currents may be detected, and it will be seen that they cause the rotations.

Or, a flat watch glass, called a *lunar*, may be employed, raised a few inches, and supported on a wire ring, kept steady by thrusting one end into an upright piece of wood, like a retort stand. Then put the camphor and water in the watch-glass, and place under the frame a sheet of white paper, so that it may receive the shadow of the glass, camphor, &c., to be cast by a steady light placed above, and somewhat on one side of the watch-glass. On observing the shadow, which may be considered a magnified representation of the object itself, the rotations and currents can be distinguished.*

MAGIC PORCELAIN.

A peculiar kind of porcelain was formerly manufactured in China, which exhibited its colour and devices only when filled with water. Though the art of manufacturing this porcelain has been lost, and the mode cannot now be described with accuracy, the following has been conjectured as not very remote from the truth. The first requisite was that the vessel be extremely thin, so that the figures to be formed might be sufficiently clear and perceptible. After the vessel has been baked, the figures, which were mostly fish, (as these were most appropriate with the water,) were formed on the inside; and, after the colour had dried, a second extremely thin coat, of the same substance as that of which the vessel was constructed, was laid on the inside and varnished. The fish, or other device would then, it is evident,

* Abridged from the Magazine of Popular Science, vol. iii.



be enclosed between the two coats of the ware of which the vessel was made. All that remained to be done was to grind the outside of the vessel as close to the figures as possible, to varnish it again, and bake it a second time; and though, after this operation, the figures and embellishments would not be at all perceptible, yet, so soon as the vessel was filled with water, they would at once be rendered clear and distinct to a degree scarcely credible. Attempts have been made to revive this beautiful art, but hitherto without success.

A GALVANIC TONGUE.

Coat the point of the tongue with tin-foil, and its middle part with gold or silver leaf; when a sourish taste will be produced, and the tongue will be galvanised.

DRINKING PORTER OUT OF PEWTER.

If porter be drunk out of a pewter pot, it will produce a more brisk sensation than when it is taken out of a glass vessel, which is ascribed to a galvanic effect. In this instance there is a combination of one metal and two dissimilar fluids, which combination constitutes a galvanic circle. In the act of drinking, one side of



MELANGE.

185

with the copper, the zinc will be dissolved, and the copper remain unaltered and uninjured.

LIGHT FROM THE DIAMOND.

Expose a fine diamond to the sunbeams, and carry it into a dark room, when it will exhibit phosphorescence: and it has been stated that such diamonds as do not display this peculiarity, may be made to do so by dipping them into melted borax.

The diamond becomes phosphorescent also when fixed to the prime conductor of an electrical machine, and a few sparks may be taken from it. It likewise becomes electric by friction; and the Hon. Mr. Boyle obtained electric gleams by rubbing two diamonds together in the dark.

TO BREAK A STONE WITH A BLOW OF THE FIST.

Select two stones from three to six inches long, and about half an inch thick; lay one flat on the ground, on which place one end of the other, raising the reverse end to an angle of forty-five degrees, and just over the centre of the stone, (with which it must form a T,) supporting it in that position by a piece of thin twig or stick, one or one and a half inch long; if the raised stone be now smartly struck about the centre with the little finger side of the fist, the stick will give way, and the stone will be broken to pieces: the stones must be laid so as not to slip, otherwise the experiment will fail.

MAGIC PAST-WORK.

Fasten a sprig of fresh rosemary, or any similar shrub, to the inside of a small bandbox, near the top; heat a thick tile, and sprinkle it with gum benzoin, and immediately place the bandbox



over it, when the acid will be sublimed by the heat, and will condense in a white vapour upon the green plant, giving it the appearance of being covered with hoarfrost.

TO MELT LEAD IN A PIECE OF PAPER.

Wrap up a very smooth ball of lead in a piece of paper, taking care that there be no wrinkles in it, and that it be everywhere in contact with the ball; if it be held in this state over the flame of a taper, the lead will be melted without the paper being burnt. The lead, indeed, when once fused, will not fail in a short time to pierce the paper and run through.

HYDROSTATIC BALANCE.

Provide a pair of scales, in one of which place a tumbler filled with water, and poise it by placing weights in the opposite scale; then hold in the tumbler a block of wood, or any substance nearly the size of the tumbler, but so that it shall not touch the sides or



MELANGE.

187

METALLIC REDUCTION.

Mix a little red lead with some powdered charcoal, and with the mixture fill the bowl of a tobacco-pipe; set it over a common fire, and in about twenty minutes the lead will be found reduced to its metallic state.

SIMPLE ELECTRICITY

ELECTRICAL ATTRACTION AND REPULSION.

Rub a piece of amber, a stick of red sealingwax, or a smooth glass tube smartly upon the sleeve of a coat, or any other dry woollen substance, and it will attract to itself bits of straw, paper, fragments of gold leaf, or any small and light bodies. The amber, wax, or glass is then said to be excited, and the attractive power thus developed is called electrical attraction.

Select a clean and dry downy feather, and suspend it from a beam by a long thread of white silk. Perform the following experiments:—



feather will be repelled for a time, but then attracted, and then again repelled. In this case, the feather having received electricity from the glass, is repelled by it; for bodies similarly electrified repel each other.

Fold a silk handkerchief, warm it, and with it rub the tube, apply it to the feather, and it will first attract and then repel it; when the feather has just been repelled by the silk, apply the tube, and the feather will be attracted. The handkerchief must be folded so thickly as to keep the hand as far as possible from the glass tube.

Roll up flannel thickly, rub it with sealingwax, and the roll will by turns attract and repel the feather; when thus repelled, apply the excited wax, and it will instantly attract the feather.

When the atmosphere is dry, take in one hand a rod of glass and in the other a stick of sealingwax, and rub them against silk or worsted; with one of them approach a bit of gold leaf, floating in the air; it will first attract, and then repel it. When the gold has just been repelled, approach it with the other rod, and it will be immediately attracted; and this alternate attraction and repulsion may be strikingly displayed by placing the two



THE ELECTRIC BALLS.

Provide two small balls of equal size, both made of gum lac and cover one with gold leaf. Suspend these balls from a beam by fine white silk threads, at a little distance from each other, so as to allow a comparison of their motions. Then rub a stick of red sealingwax upon any woollen substance, or warm it at the fire, and present it to the balls; when it will be at once seen that the gilt ball, which readily admits of the transfer of electricity from one side to the other, will be sooner and more powerfully attracted than the other ball, which allows of no motion in its electricity. The latter ball will, however, by slow degrees be feebly attracted, and may at length be made to adhere for a considerable time to the sealingwax.

THE ELECTRIC DANCE.

Lay on a table small pieces of paper or cotton, feathers, or gold leaf; then rub with a silk handkerchief a glass tube, hold it parallel to the table, and the several pieces will be alternately attracted and repelled, and a kind of electrical dance will be kept up.

If to the further end of the tube you hang a brass ball by a thread of linen, hemp, or metallic wire, the ball will participate in the magic power of the rubbed tube; but if the ball be suspended by a cord of silk, worsted, or hair, or be attached by wax or pitch, the attractive and repulsive properties of the rod will not pass into the ball.

ELECTRIC LIGHT

Shake a barometer in a dark room, and light will be produced in the empty part of it by the friction of the quicksilver electrifying



the glass tube. Even the friction of air upon glass is attended by electricity, as has been found by blowing upon a dry plate of glass with a pair of bellows.

ELECTRIC LIGHT FROM BROWN PAPER.

Provide a piece of thick brown paper, thoroughly dry and warm; rub the paper briskly in a dark room, and there will dart forth flashes of electric light to the fingers, to a key, or to any other conductor that may be presented to it.

Heat a small portion of sulphate of quinine in a spoon over the flame of a lamp, and it will become luminous and highly electrical.

SUDDEN PRODUCTION OF LIGHT.

Take a piece of dry and warm wood into a dark room, suddenly rend it asunder, and a flash of light will be perceived. The same effect may likewise be produced by suddenly snapping asunder a stick of sealingwax in the dark.

Or, break a Prince Rupert's drop, and electrical light will pervade the whole, so that its form will be distinctly visible in the dark. The light will appear even if the experiment be made under water.

ELECTRICITY OF THE CAT.

Place your left hand upon the cat's back, and your right hand upon its tail.



and the experiment be made in a dark room, the electric sparks may be very plainly seen.

Very distinct discharges of electricity may also be obtained by touching the tips of the ears, after applying friction to the back ; and the same may be obtained from the foot. Placing the cat on your knees, apply your right hand to the back ; the left forepaw resting on the palm of your left hand, apply the thumb to the upper side of the paw, so as to extend the claws, and, by this means, bring your forefinger into contact with one of the bones of the leg, where it joins the paw ; when, from the knob or end of this bone, the finger slightly pressing on it, you may feel distinctly successive shocks, similar to those obtained from the ears

It is, perhaps, unnecessary to add, that, in order to this experiment being conveniently performed, the experimenter must be on good terms with the cat.





PAUL PRESTON'S

BOOK OF GYMNASTICS:

Instructions

FOR

SPORTS AND EXERCISES

TO PROMOTE THE HEALTH AND LONG LIFE OF ~~HIS~~
YOUTHFUL FRIENDS.

THE
NEW
EDITION
OF
THE
HISTORY
OF
THE
CITY
OF
NEW
YORK

THE
HISTORY
OF
THE
CITY
OF
NEW
YORK

THE
HISTORY
OF
THE
CITY
OF
NEW
YORK

THE
HISTORY
OF
THE
CITY
OF
NEW
YORK

THE
HISTORY
OF
THE
CITY
OF
NEW
YORK

THE
HISTORY
OF
THE
CITY
OF
NEW
YORK



CONTENTS.

	PAGE
Preface	7
Preliminary Exercises	11
Exercises on the Parallel Bars	33
Exercises on the Horizontal Pole	69
Horse Exercise	83
Leaping	108
Leaping with the Pole	113
Climbing Apparatus	119
Pulling the Rope	124
Throwing the Lance or Spear	127
Climbing the Plank	132
Giant Stride	133
Climbing the Mast	134
Running	136
Recapitulation	140



PREFACE.

A FEW words to the Guardians of Youth—whether Parents or Governors of Schools, or of any institutions where numbers of children are congregated together—may not here be amiss. And first, let me address myself to those parents, who, while they wish to see their sons and daughters healthy and strong, too often suffer their fears to overcome their desires, and fancy they see danger in any sport or exercise that goes beyond a walk or a gentle trot. Now let me earnestly intreat such to lay aside all this, and encourage the practice of such evolutions as are contained in this book. They will have the happiness of seeing those they love so dearly become robust, hardy, and full of spirits, instead of being nervous, headachy, and spiritless beings; for there is not a single exercise in the book that can really be called dangerous. To Masters of Schools



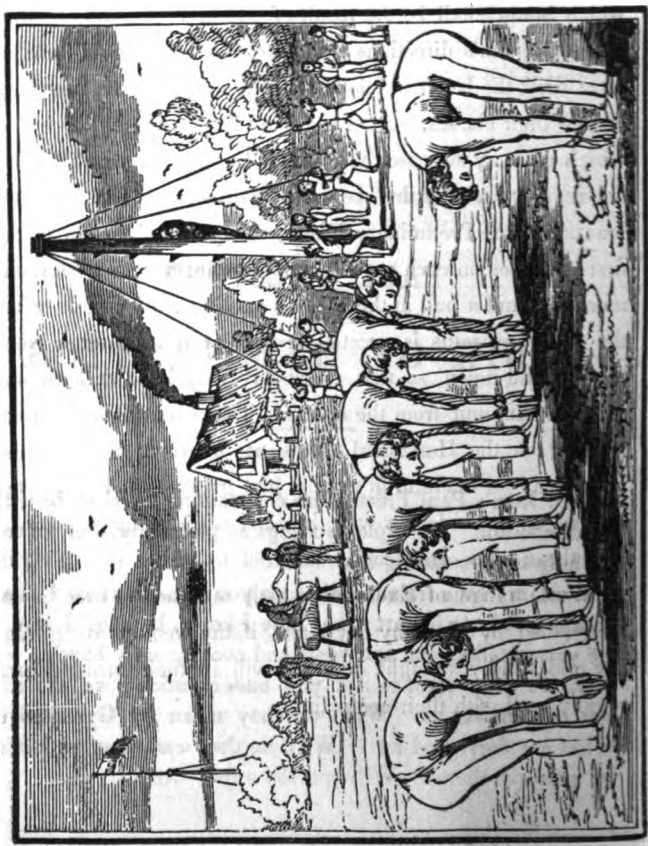
let me say, that although cricket in the fields is an admirable thing, and running about the play-ground another admirable thing, still boys, like men, are fond of variety. Many enlightened instructors of youth have often wished for some Manual of Gymnastics to direct them ; and for want of it have chosen rather not to attempt them at all, than not do them well.

Here then is one to their hands, and though written expressly for boys, the exercises in each section have been all so philosophically laid down as to progress from the easiest to the most difficult ; thus forming a complete code by which the teacher may be guided. Where there is a covered play-ground for the winter, these Exercises are the best amusement imaginable, and will render the pupils hardy, healthy and cheerful, without unnecessarily exposing them to the inclemency of the weather. The Author would suggest that one or more Captains or Leaders be chosen from among the boys of a school by the boys themselves, who, with the Manual for their guide shall carry them through the various exercises. He would recommend too that the Preliminaries should be well practised for a month, dividing the children into classes, according to size, and make it a point of honor to stand first in the class.



which honor shall be the result of superior care and attention to the Captain's directions ; and the Captains should have an extra drill, the better to enable them to give their lessons properly to their classes. After the month's practice, by the end of which we may suppose the Parallel Bars and Horizontal Poles are ready, they may then be taken to these, after half an hour's practice of the Preliminary Exercises, trying only a few of the first exercises on each ; they can then finish with a run one morning, and a pull at the rope on another ; afterwards, when the other apparatus is erected, a regular routine for a week may be laid down, so that every day may have at least one exercise different from the others. To prevent them from exercising on the Horizontal Poles at improper times, these poles may be made to fit tightly into grooves, and when not wanted, an upward blow with the hand will disengage them.

If these rules are steadily adhered to, there is nothing in the whole range of Exercises which may not in time be accomplished by a healthy boy ; and if the weaker are gradually and kindly brought on, they will in their turn perform equally well with their companions.





PAUL PRESTON'S
BOOK OF GYMNASTICS.

On! here's Paul Preston the entertaining traveller, he'll tell
us all about it. He explains things so pleasantly, that we can
not help understanding him.

Well, my little friends, what do you know? I am
I love to



Stop, stop! you said you wanted to ask me one question, and you are running through a whole catechism; but to set your minds at rest, I will tell you at once I know all about the matter, and in due time, if you will have patience, will endeavor to put you in possession of my knowledge upon the subject, being an old Gymnast; and reckon it not the least among the blessings I enjoy, that I had the opportunity of going through a regular course of these exercises, which, together with temperate habits and early rising, have enabled me to be so active, both in body and mind, as I am up to the present moment.

Now then to answer the first question in your catalogue. Gymnastics is a term of very extended signification. Among the ancient Greeks it meant that part of physics which relates to exercises for the health.

It was that branch of education which, after certain prescribed rules, tended to develop the bodily powers of man, rendered his frame robust and agile, and fortified it against the common accidents of life.



the town of Olympia, and were celebrated, or exercised in the first month of every fifth year, and lasted five days. These games were called Olympic Games; you have no doubt read about them.

O yes, we remember that.

Well, the place where the Greeks performed these exercises, which consisted of leaping, running, throwing, boxing, wrestling, horse and chariot-racing, and contests in poetry, oratory, music, philosophy, and the arts of all descriptions, was called a *Gymnasium*. You all recollect how astonished Xerxes the Persian was at the bravery of Leonidas and his little band of three hundred men, so that he declared it was impossible to conquer the Greeks, and ran away as fast as he could to his own country again.

No doubt all these Greeks had been trained in the *Gymnasium*, for they well understood what an intimate connexion there is between body and mind; how invariably the healthy or sickly temperament of the one influences that of the other; so that when the body is strong, healthy and active, the mind is cheerful and elastic, and capable of noble deeds; but when the former is sickly and diseased, the latter is languid and



nastic exercises disappeared altogether. The great men had their tilts and tournaments, while the people were mere slaves, used only to lead their horses and carry their masters' arms. Even these have passed away, and are known only to us moderns by the accounts we read in books ; but, after all, they appear to have been very silly amusements.

The Germans were the first to revive "this relic of an age gone by." To Professors GutsMuth and Jahn the merit of the discovery is particularly due. When they had made a careful examination of the structure of the human body, they set about devising numerous exercises, arranging them in a well adapted series ; and thus restored Gymnastics to something like their former rank and importance. Many towns in Germany and Switzerland soon had their Gymnasiums, and the youth, and even grown men, derived more pleasure in exercises which fortified, than in amusements which paralyzed the powers of their bodies.

To finish this long story,—I shall only add that these exercises are used in the British Naval and Military Schools, where the boys are very clever, climbing like monkeys, without any fear or danger of falling ; they run and jump like antelopes, so that they not only lay up a large stock of health and strength for future years, but are rendered more active,



and consequently more useful, members of the professions for which they are intended.

Now, my lads, it happens luckily that Paul Preston has by him a regular series of all the various exercises they used to perform at the Gymnasium under Professor Voelker ; and if you will promise to attend to my directions, and persevere in the practice of them, I promise in return that all of you, whether sickly or weakly, shall become strong active and healthy.

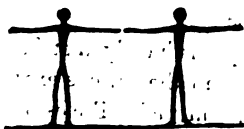
O yes, do let us begin ; we promise to pay particular attention to all you tell us ; and—

Only practise it heartily, and I shall be satisfied.

We will begin now, if you like.

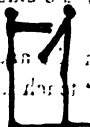
Well then, do as I do. Pull off your caps and coats, take off your stocks and neckerchiefs, and unbutton your shirt-collars ; don't be afraid of catching cold, I'll make you warm enough before I've done, only when you leave off, clothe yourselves, the sooner the better. Stand in a line—head easy—heels close—toes turned out—body upright—stomach kept in—arms hanging straight by the sides—hands closed, with the thumbs inside.

Now then, move to the right and left, and stretch out your arms, so as each can barely touch his neighbor's fingers' ends thus—



Remember, boys, every thing must be done with spirit, and when I have shown you how to move your legs and arms, and you are not tired of the sport, I'll have some parallel bars, a horizontal pole or two, a couple of wooden horses, some leaping poles, and other things, which I will tell you about by and by. So we'll have a Gymnasium of our own.

1. Attention!—Bring your arms quickly up in front as high as the shoulders, nails upwards—now swing them forcibly back, so, turning the nails outwards—body upright as a dart—again and again—half a dozen times.





2. Mind when I say Attention, which I shall do at every new exercise, you are to stand as I told you at first. Place hands on hips—thumbs behind—fingers in front—feet close. Now rise as high as possible on your toes, and stand for one minute by the clock. Once more—try again—elbows back That will do, boys.

3. Look! bring your elbows sharply back thus, so that the fists be close to the sides (a)—send them sharply forward (b)

(a) (b)



so,—back again—don't be afraid of hitting the wind—do it three times more.

4. Attention! Hands on hips—feet close—rise slowly on your toes—now jump, but keep your knees quite stiff.



5 You see I give one exercise for your arms and another for your legs, alternately. Here's another for your arms. Bring your fists quickly up, so, against your shoulders in front, elbows close to your sides—throw them up sharply, so as to be at the full stretch—again, to your shoulders forcibly—up again—down—up—down—well done.



6 Now for the legs. Hands on hips—feet close—up with the right leg in front as high as you can—knees straight--



no stooping forward—now the left leg—right—left—right—left.



7. Fists smartly up to the shoulders, nails turned inwards, elbows close to sides—throw your fists downwards with all your might. Again to your shoulders—quickly—all together—down—up—attention !

8. Feet close—hands on hips—throw out your right leg sideways, as I do—body upright—no leaning on one side—steady—left leg—right—left.

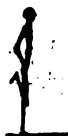


9. Well, boys, let us now combine two exercises into one, the 5th and the 7th ; but remark, you are to stand firmly on



your feet, don't rise on your toes, or the exercise will be of no service. See—bring your fists strongly up to your shoulders—throw them up as high as you can—down again to your shoulders—now sharply towards the ground—once more—four or five times.

10. Here's another leg exercise, good for your knees. Hands on hips—feet close—keep steadily in your places, and kick your thighs with your heels, first with your right, then with your left.



11. Raise your elbows as high as your shoulders, like this(a)—rest your fists on them, nails turned down—throw your



12. Do the same as before, with this difference only, that you must throw your arms behind, keeping them level with the shoulders.

13. Another kick, boys. Hands firmly on your hips—place your feet close, rise on your toes, and kick your thighs with both heels at once—just so—back as stiff as a soldier.



14. Now, lads, I have made you a little pliable, you may try this, which will bring your muscles into excellent action, and is at the same time, if done well, a very graceful exercise



because a perfectly scientific one. Heads up—bring your arms, with fists closed and thumbs inside, slowly up in front, and turn them completely round, so as to form a circle several times.



15. This next exercise will be rather difficult at first, but a little practice will soon enable you to master it. Observe—Feet close—hands on hips, and touch your breast with your knees alternately as I do—toes pointing to the ground—and keep your body perfectly upright—right knee—left knee.





17. Who can do this well ? Not one at first, except myself. I shall set you all laughing, and you will laugh at each other too. Try—hands on hips—feet close—stand on toes—bend your knees very slowly, and lower your body so, till your thighs touch your heels, like an indian chief. Mind—keep your knees quite close, and your body quite upright—now rise



very gradually. Ah ! there you are, all swimming on dry land. Never mind, try again.

18. This next will exercise the muscles of your chest. Bring the left fist to the front of the right shoulder, and at the same time extending the right arm with a quick motion, thus, in a line with the shoulder—now throw the left arm sharply out, and bring your right fist to the left shoulder. Do it with spirit, boys—again and again.



19. Another comical kick. Stand with your feet close, hands on your hips—now raise your left leg behind—stand on your right toe, and kick your right thigh with your right heel six times—now do the same with your left heel, standing first on your left toe.

20. Open your hands while by your sides—now raise them sideways and touch the backs of your hands sharply over your head—look at me.



21. Attention! Again open your hands—extend them in front, palms touching—now swing them back heartily the height of your shoulders, and make the backs of your hands meet behind. You must not turn the hands round, any one can make the backs meet then, but few can at the first trials the other way. A famous exercise for the chest.

22. Are you tired? If not, put your hands on your hips—keep your feet close—now hold out your right hand in front



level with the shoulder, and try and kick the palm of it with the right foot six times—knees stiff—now the left hand and left foot—don't stoop, and keep your knees quite straight



23. Again. Open your hands, extend them in front, the backs touching, and swing them back in a line with the shoulders, till the palms touch behind

24. Now, my young Gymnasts, try this. Hands on hips—rise on your toes—steady—bend your knees, and go gradually down, till your thighs touch your heels—extend your arms, and fall forwards on your hands, (take care of your noses !) so that your body forms a straight line from the head to the heel—like mine—rest on your hands and toes.



25. A chinese bow. Stand—feet close—hands open—hold your arms straight up like the 5th exercise, palms in front—



PAUL PRESTON'S

ard, and touch the ground with the tips
times—keep the knees quite straight—



exercise again.—Now, while you are
ttle from your toes, and clap your hands
ground again—rather hard to do, isn't it?
re.

length. Each stand facing his neighbor
left hand on his hip, his right foot for-
n front—now grasp each other's hands—
—and try who can bring down his oppo-
he right or left.

to a rest *à la Turc*? Well then—feet
—cross your legs—bend your knees grad-
—hus—now rise perpenpically, without
s.



B

29. Once more
hand on hip, left foot

30. Can you do
—rise left leg in front
down on the ground, and

31. Another trial of strength
pose your neighbor, left
back the middle finger of
back. Never fear, you can



32. To your ranks again, and
rise, only bending down with
leg extended in front.



29. Once more. Try the 27th exercise with the right hand on hip, left foot forward, and left arm in front.

30. Can you do this? Feet close—extend arms in front—raise left leg in front—bend right knee gradually, and sit down on the ground, so—then get up again in the same posi-



31. Another trial of strength. Now, boys, each stand opposite your neighbor, left hand on hip, right foot in front, and hook the middle finger of each other's right hand, and pull back. Never fear, you can do no harm.



32. To your ranks again, and try to perform the 30th exercise, only bending down with the left knee, and the right leg extended in front.



33. Face each other again, right hand on hip, left foot forward, and hook the middle finger of each other's left hand and pull away.

34. Open compasses. What's that? Why, feet close—hands on hips—and jump as high as you can. At the same time spread out your legs like this.



35. Let the palms of your hands touch behind your backs, with the fingers pointing downwards—keep your hands quite close, and turn the fingers inward, and bring the hands as high as possible up the back, in this manner.



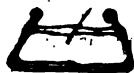
36. Now for a jump. Feet close—hands on hips—spring



up as high as you can, at the same time opening your legs. then cross them when coming down, &c.



37. Sit by twos, facing each other, with the soles of the feet touching—now each pair take a stick, and grasp it thus, and pull against each other, not by jerks, but steadily—keep your knees straight—now do it with knees bent. Once more with legs spread.



38. To your ranks. Attention! hands on hips, right foot forward, toe pointing downwards, as in marching—spring for-

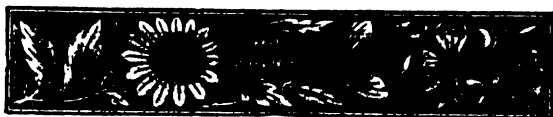


39. Face each other—hook one another by the fingers of both hands, toes meeting—lean back and go round quickly. We used to call this the roasting jack.



40. Take your places. Again hands on hips—feet close—rise on toes, and jump forward with straight knees—jump backward to your places.

41. Let each grasp his left hand with his right, or, what is



42. Put your right arm behind your neck, bring your hand in front of your chin, and try to pull the right ear with the right hand.

43. Feet close—run with hands on hips, and try to kick your thighs alternately.

44. Try the 42d exercise with the left arm on the left ear—don't be afraid of pulling your ear too hard.

45. See if you can improve upon the 43d exercise, by trying to kick both thighs at once, as you jump forward. My little friends, the object in these different exercises is to give a great elasticity to the muscles of the legs, the necessity for which you will see by and by.

46. You remember the exercise I showed you No. 12?



and stiff—let your body form a straight line from head to heel, as you did in the 24th exercise—remain so for a short time—now bring your feet, with a spring, between your hands—rise.



47. Hands on hips—left foot in front, toe pointing towards the ground—jump forward on the right toe—back again to your places.



48. Perform the 46th exercise as before; but, previous to rising, spring the hands from the ground and clasp them—rise.



be tried without having performed what I have already shown you. With diligence then there is no danger. Attention! Hands on hips—feet close—spread out your legs gradually as far as you can—try and place the palms of your hands flat on the ground between the legs—draw up your legs slowly and evenly.



51. You may think I repeat the exercises on the toes too often ; but believe me, they are the best initiation to the exercises on leaping you can possibly have. So have patience, and only practise these and two or three more which I shall give you, and you will have as much elasticity in your feet as any deer in Vermont. Practise then the 47th and 49th exercises, only with the leg stretched out behind in all these cases, keeping your body perfectly upright.

52. Once more. Place hands on hips and run forward on your toes, while the knees are kept perfectly straight.



Fold your hands behind you, bring the right foot forward as far as you can, bend the right knee, and try to touch the floor with your forehead, like this.



What is Ko-tow ?

Why it is a ceremony exacted from all tributary princes and ambassadors, on approaching the presence of the emperor of China ; and consists in kneeling, placing the hands as you see above, and then knocking the head thrice against the floor. The visiter now stands upright, and by word of command kneels and knocks again, and afterwards a third time, making in all *three* prostrations and *nine thumps*, on which the music strikes up the tune of 'Subjugation manifested ! a glorious subjugation !' A man much about court in China would require a skull as thick as a buffalo's.

This ceremony is required not merely in the imperial presence, but on receiving any message or donation of broken victuals from the emperor ; and the Dutch embassy (whom the Chinese lodged in a stable, and treated with every indignity) actually performed the Ko-tow for some half-gnawed bones



m 1795, without gaining one single point by their abject humility.

54. Feet close—hands on hips—now rise on your toes, and jump completely round, first to the right, then to the left.



55. Again try the Chinese Ko-tow, only stretch forward the left leg.

56. Lift up the left leg, and stretch it out behind—stand steady, boys—bend your right knee, and lower yourself slowly, touch the ground with your left knee, and rise very gradually.





mour. Each one take his man—fold your arms—elbows close to body—hop on right leg—try to bring your opponent out of his position by a blow of your right shoulder against his right shoulder.



58. Suppose we try the 56th exercise ; only we'll stretch out the right leg as far as we can behind, and touch the ground with the right knee.

59. Let us have another hop. Fold arms as before, and let each try to break his opponent's position, by hopping on the left leg, and hitting him with the left shoulder.

60. Hands on hips—bend gradually forward, at the same time stretching out the left leg behind till the head, body and



Well, I have given you sixty preliminary exercises. I could have given you many more ; but as my object is not to make posture-masters nor tumblers of you, I am sure, from my own experience, they are quite enough for all practical purposes. Some of them are no doubt ludicrous ; so much the better, you will enjoy them the more. Ridiculous they can only appear in the eyes of a vulgar mind, which cannot perceive that health is more surely obtained, and easily preserved, when the mind is agreeably enlisted in the pursuit, than by all the rules that have been written and published for the guidance of dyspeptic patients or hypochondriacal subjects.

Good bye for the present ; the next time I see you, I shall have the parallel bars quite ready.



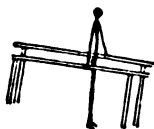
**CHAPTER II.****EXERCISES ON THE PARALLEL BARS**

As some of you, my young friends, may perhaps like to erect parallel bars of your own, a few hints may not be unacceptable; as upon the good or bad construction of these depends the pleasurable performance of the exercises upon them, or otherwise. The bars or top rails should be six feet long, and about four inches deep; so wide, that when the hands are laid on the top, the fingers and thumb may come easily on the sides, and afford a firm purchase; the tops should be a little rounded, and made very smooth, the posts must be strong and fixed firmly in the ground, the rails projecting about four inches from the ends, and rounded off to prevent hurting the legs. They should be wide enough apart so as to allow the body to swing easily—say about twenty inches—the distance being regulated according to the age and size of the parties using them, and so high that the gymnast must make a



slight spring, in order to suspend himself on his hands, as in the 61st exercise, where the posts, however, are not exhibited the full length.

61. What do you say to making your first appearance at the bar? Let's take a walk over it. O, any one can do that. Well then, follow me. Begin at this end and walk on your hands to the other end, and back again; you will find it try



your arms more than you imagined. Walking backwards, *a la crevisse*, is much harder than walking forward, especially as you must do it with the arms quite straight. Do that three times forwards, then three times backwards.

62. Keep your arms straight and body quite upright, as in the last exercise;—now try and raise the legs level with the bars, three times, in the form of letter L. Mind your knees are not to be bent in the least.



63. Now, boys, you must learn to look at both sides of a question ; therefore, seize the left bar quickly with the right hand in front of you, keeping your arms stiff—just so—that you may not come to the ground ; while in this position, put your left hand behind you and seize the right bar—bring round the right hand immediately to support you, thus—forming a complete circle—do this several times.



This, and many other exercises, will render both hands and arms equally facile. It would be well if boys and girls were accustomed to do various things with either hand, a faculty that would be very serviceable to them in after life.

64. I will now show you another very neat exercise—that is, when it is done well. Suspend your body between the bars—arms straight—now clap your hands in front—and again seize the bars without coming to the ground. Do the same behind.





65. Turn your hands inside of the bars, and walk from one end to the other. First try to do this forward, and then attempt it backward.



66. Grasp the left bar firmly, and touch it with the right hand, and bring it back directly—hold the right bar tightly,



and touch it with the left hand. Remember, each action must be done with great rapidity, or you will be sure to come to the ground.

67. Here is an exercise that will try your loins. First position—raise the back slowly, as high as you possibly can, keeping the arms straight—then gradually sink to the original position. No fear of lumbago after this.



68. Do you think you can now jump forward on the hands along the bars? Try and do it first with banded knees, then try with the knees kept straight—afterwards endeavor to jump backward, first with bent, then with straight knees.

69. Perhaps you will be able to touch first the right bar, then the left, with the hands turned inside the bars, as in the 65th exercise.

70. Jump again along the bars, hands turned inside, first forward, then backward—knees bent, the easiest way—knees straight, rather difficult; but never mind, only try it; you will succeed by-and-by.

71. Make yourself at home by resting the fore-arm and elbows on the bars—and try to raise first one arm straight, and then the other. When you are up with arms straight, you may come gently down on the arms again—first on the right arm, then on the left. Do this three times.





enable you to perform the exercises which I mean to show presently, with ease, grace, and freedom from danger. Swing with arms straight, slowly, and not very high at first, and at length as high as possible.



73. Rest on your fore-arms in my arm-chair, then walk along the bars in that position ; but take care to keep your feet from the ground.



74. This exercise will bring the muscles of your back, and especially your loins, as well as your arms, into full play.



75. Now, my boys, for a swinging exercise; and as I will stand by to assist, do not be afraid to swing boldly, keeping the legs close together, and throw them gracefully over the left bar in the front of the body, like this—taking care to



catch hold of the left bar with the right hand on coming down on the feet. In all the swinging exercises, be careful not to swing too long, and keep the legs close together, unless otherwise directed.

76. Each one again swing, and throw his legs over the right bar in front, catching the right bar with the left hand on coming down as before. Mark, boys, do not swing long, or you will either over-balance or tire yourselves before the exercise is completed.





77. Another elegant exercise, when well done. Swing as high as you can, and throw the feet over the left bar behind the body, as you see me—precautions as before. You will find, as I go on, that I make you bring both sides of your body into action, in order to strengthen every muscle.

78. Swing once more, and throw the feet over the right bar behind the body—precautions as before. You see I am



rather careful ; for this simple reason, a little care often prevents a great deal of mischief.

79. Here's a key that will unlock any chest, although it be as tight as one fastened by Chubb's patent. Bend down as low as you can, and rise up. Do this slowly, that the pectoral muscles may be gradually accustomed to the strain, which is felt at first but which after a little practice is not

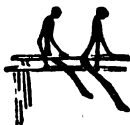


80. Take another swing or two, and throw the legs over the right bar in front, so as to sit on it so. Now bring the legs again between the bars with a spring—again swing, and do the same over the left bar.



81. Arms straight, as in 61st exercise. Turn quickly round between the bars, so as to change the position of the body, first from the right side, then from the left, without coming to the ground—just the same as 'right about face' of the drill-serjeant.

82. Swing and throw the legs over the right bar behind so as to sit on it. Throw them with a spring between the bars, and without stopping, bring them over the left bar behind. Do this alternately several times.





83. This next, you will see, is a combination of the others. Swing and bring the legs over the right bar in front, as in action 73—then swing and bring them over the left bar behind. Swing and bring the legs over left bar in front—then throw them over the right bar behind:

84. I'll show you how to make an angle of 45 degrees without rule or dividers. Raise your legs in front of you above the bars, and spread them open without touching bars—after this fashion. Do the same behind the arms.



85. Throw the legs with a neat swing over the right bar in front, partially sitting on it, as in exercise 80,—then with a spring throw them completely over the left bar, so as to clear it, and come to the ground on the feet. Observe precaution as in exercise 75.

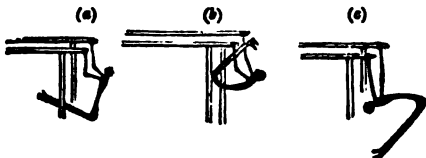
86. Rest on the fore-arms, and swing in that position gently at first, to get confidence, then increase the height, both back and front.



87. Swing the legs over the left bar in front, afterwards throw them completely over the right bar in front, and come down to the ground on the feet.

88. Swing the right leg, bring it sharply from behind over the right bar, quickly lifting up the right hand to let the leg pass. Remember to hold fast, so as not to drop down. Do the same with the left. This is best tried at first, at the end of the bars.

89. The one I am about to show you was jocularly called the Barber's Curl. Hang on the end of the bars, so as to form the letter L, so (a)—then turn gently over, thus, (b) without letting the feet touch the ground, like this, (c). Now return gradually to the first position. How do you feel?





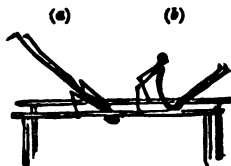
your back fall into an easy curve. That was called German Sausage at our Gymnasium.



91. Rest on the fore-arms and swing, and rise up as the legs come forward,—then go down again on the fore-arms as the legs go backward.



92. Swing on hands, and bend down as the legs go backward (a)—then rise as the legs come forward, (b). Do this several times.



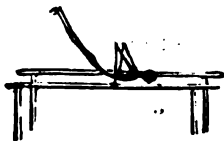
5

D



93. Suspend yourself between the bars, then stoop down as in action 79, and kiss the right thumb—rise—stoop down again to kiss the left thumb—and so on alternately. If your elbows meet behind, don't be alarmed.

94. Swing on the hands, and bend down as the legs go backward, grasshopper fashion.



95. Swing as before, and come down on the fore-arms as the legs go forward, just so.



96. Swing on the fore-arms, and throw the legs over the bar in front, thus—first on the right, then on the left side. Do the same behind.



97. Raise the body slowly, and bring the legs completely over the left bar without sitting—remain a short time, and bring them slowly within the bars again. Do this alternately over each bar.

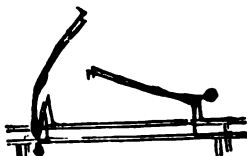


98. Swing, and throw the legs over behind, so as to sit—bring them with a swing inside the bar, and without stopping throw them over the same side in front—first on the right—then on the left bar.

99. Swing at one end of the bars—and with one spring jump between the bars to the other end, with straight arms—first forward and then backward.



100. Rest on the fore-arms—swing and throw the feet over, so as to take a complete somerset. Do this in the middle of the bars—afterwards from the end—first forward, then backward.



101. Swing at the end, and throw both legs backward over the end of the bars, as before, with one leg. See action 88.

102. Swing with bent arms, and take a somerset backwards.





103. Position as in the 61st exercise. Now bend down and kiss the bars right and left.



104. Swing on hands—while in full swing stoop down and kiss the bars alternately.

105. Swing on the fore-arms, then throw the legs gracefully over the right bar behind, like this, and come to the ground on your feet, unless you like to come on your head better.



106. Swing on the fore-arms, and then throw your legs over the left bar, coming to the ground in a similar manner. Mind you catch hold of the bar.



107. Turn on fore-arms, and take a somerset backward slowly. This is different from the 100th exercise, for it is in fact merely a rolling over on the bars.



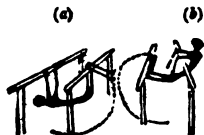
108. Swing in the middle of the bars, and throw both legs backward over the bars, and bring them in front. See action 101. This requires not only more energy, but a tact, which confidence, the result of practice, alone can give.

109. Swing on hands, arms stiff, and throw a somerset, keeping the feet close, so as to come between the bars, catching the arms between the bars on coming down. Don't be afraid, I shall stand by you ; only keep your legs close.





110. Suppose we take a serpentine walk. You have only to sustain the body on the bar outside ; throw the legs underneath one bar, and over the other, as (a). Seize this other bar with the hands on each side of the legs, draw up the body so as to sit on the bar, the legs being outside ; gradually slide down, catch the bars with the arms, as (b)—at the same time throwing the legs so as to catch the opposite bar behind by the instep, release the arms separately, and bring them underneath—hold on bar, hands over, slide the legs backward, and with a spring come to the first position.



111. Swing between the bars, and throw the legs over the right bar, so as to sit thereon with the back to the other bar ; gradually slide down, holding by the hands inside, and





throw the legs underneath, so as to catch the left bar by the instep, suspending yourself at the same time by the hands. This was termed the Bird's Nest.

112. Walk along the bars with bent arms, grasshopper fashion—first forward then backward.

113. Swing while in grasshopper position.

114. Swing and jump along the bars with bent arms, first forward, then backward.

115. Walk from one end of the bars to the other, with legs spread in front, afterwards with legs spread behind the arms.

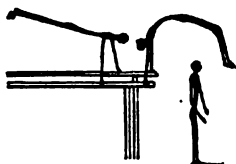


116. Swing at one end with bent arms, and spring to the other end. This is called the Grasshopper Spring.





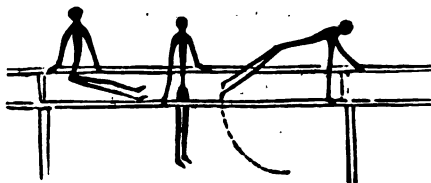
117. Swing at one end of the bar, and take a somerset backward, coming down like this.



118. Swing and spread the legs while above the bars, both before and behind.

119. Take a short run towards the bars on the outside, catch the nearest with the right hand, and spring over the bar, immediately let go the right hand, and catch the same bar with the left, passing the right hand to the other bar, and without coming to the ground swing the legs gracefully over that other bar behind.

120 Take a run as before, catch the nearest bar with the left hand, spring over, immediately letting go the left hand, and catching the bar with the right; at the same time pass the left hand to the other bar, and, without touching the ground, swing both legs with ease over the other bar in front.



I think, my little friends, I have pretty well explained to you all the useful practices at the bar—sufficient to make you expert barristers, even if you have never studied Tidd's Practice. I think I hear you say, This is good fun; we feel ourselves stronger than we were, and should like to accompany Paul Preston to the Pole.

With all my heart: come to me tomorrow morning at six o'clock precisely, and we'll take an excursion thither; nothing like rising early, my lads; you all know the old proverb,

Early to bed, and early to rise,
Will make a man healthy and wealthy and wise.

In truth, I tell you once for all, that these exercises should be performed before breakfast; it is wrong to use much exertion immediately after a hearty meal, or at least till digestion is fully accomplished. So, good bye till I see you again. Good bye. Good bye.



CHAPTER III.

EXERCISES ON THE HORIZONTAL POLE.

I AM now going to show you a set of exercises which was much admired at the Gymnasium, because they exhibited the strength, agility, and elasticity of the gymnast in a very novel way ; but, independently of this, there was a little daring in some of them, which they who had patiently and systematically persevered in the preliminary exercises and those on the parallel bars, could perform with a degree of skill that often excited the admiration of many of their compeers, who were too impatient to submit to these training processes, for such they really are.

You see this horizontal pole is rather more than two inc



upright posts, which are firmly fixed into the ground, so as not to shake about, and it is so high, that you are obliged to make a slight spring to reach it. Of course, when there are a great number of you, there should be three or four poles in a line, at various heights to accommodate different classes. Although it appears small, it will bear my weight, and therefore, boys, I am sure it will bear yours, that is, if there is only one or two on it at a time.

I dare say you are anxious to begin, and tired of my preface ; but I have not quite finished it. However, I have only to request, when you and your companions are exercising on the pole, in my absence, that one of the cleverest and strongest be chosen as a leader, whose duty it must be carefully to watch the progress of every action, and be ready, in an instant, to catch the gymnast, should he make a slip.

The knowledge, that some one is upon the alert to assist instantly in case of accident, is of infinite service in all cases, especially in gymnastics, as it creates a confidence of mind that enables the tyro to put out all his energies, and direct them in the most efficient manner.

121. The first thing you have to do, is to learn to suspend your body by both hands on the pole. Observe me attentively, and you will perceive that my thumbs are on the same side of the pole as my fingers, not grasping it as you



would a roll of paper—your arms straight in a line with the body, so that the power may be more effectually applied to move the weight—keep your knees quite straight and stiff, and your feet close, unless you are told otherwise—just like this.



122. Now to try the muscles of your arms. Hang from the pole only by the right hand. Hold on if you can for half a minute, then change to the left hand—six times alternately. Two of you may perform this exercise at the same time, only keeping towards each end.





123. Hang from the pole at one end, as explained to you just now — hands over the top — and see if you can walk with them from one end to the other, and back again — take moderate strides, and slow — mind, knees straight.



124. Try this exercise again, only bring your hands under, and grasp the pole, so that the fingers may point towards your face — keep your thumbs too on the same side. This mode is generally found easier than the other; but you must practise both, for the power of grasping firmly is of infinite importance.

125. Ready, boys. Let one of you hang on the pole with your back to the post, and one hand on each side of the



126. See if you can discover any thing beyond the pole. Hands over the pole, as in the 121st exercise—draw yourself up gradually, till the head and chest are above the pole, as you see me—then slowly descend thus—three times running—and you will find it quite enough. Two may perform this together.



127. This is easier. Hands under the pole, as I directed you in 123d exercise, and draw yourself up like this—bring your chest close to the pole—descend slowly—do this thrice. You will find, at first, that each time you rise you will find it more difficult ; but after having gone through the whole or



these exercises, and practised them well, you will be able to do this exercise a dozen times running.



128. Shoulder pole ! What's that ? Why only just to hang on the pole, as I told you in 125. Gradually draw yourself up till your right shoulder touches the pole in real earnest, like a rabbit or wild-duck merchant—now descend slowly, and rising again, let your left shoulder touch the pole—do this three times each way.



129. The idea of jumping along the pole on the hands has puzzled a great many who would not undergo the preliminary training. They have felt that their hands were held as



fast to the pole as if they had seized the electro-magnetic apparatus at the exhibition gallery. You, my lads, who have gone through all this, have only to hang on one end, as in the walking exercise, 123, and by drawing yourself and your legs up a little way, make a spring along the pole—do this till you reach the other end, then go back whence you came. But I must tell you, that after a while you ought to manage this exercise with knees quite straight—the arms are to be benefited, not the legs, in this case.

130. Now try another jump or two, with the hands under the pole, and you will find it comparatively easy. I dare say, at first you will find it blister your hands, at least it did mine, and many others besides me—but never mind, gymnasts ought not to care for trifles.

131. Hang once more, and try to bring your legs into a horizontal position, as you did on the parallel bars, forming the letter L. Few can succeed who have not attempted on the bars, after this manner.





132. Again suspend yourself on the pole, and bring your legs slowly up till the instep touches the pole, as you see here. Whenever I say slowly, I do it, because young gymnasts are apt to spring violently, in order to attain their object,



and after all cannot. But this is not all; they run the risk of straining the muscles by such violent exertion, and, what is worse, rather lose than gain strength by such means. If you cannot accomplish any particular exercise after a trial or two, let it alone, and try another; you will be sure to accomplish it by and by; I know that by experience.

133. Hang once more on one end of the pole, with your face towards the opposite post, and with a slight spring throw your right leg over the pole, suspending yourself firmly by the hands on each side—now release the right leg, at the same time throwing the left leg over the left side of the pole. Do this alternately six times.





134. See now if you can turn yourself inside out. Bring your insteps up to the pole, as you did in No. 132—keep them firm against the pole, and let your body turn easily under the pole, and look me in the face, just so—then go back the way you came.



135. Another excellent extension of the back and loins. Fix your hands on each side of the pole, and slowly bring the legs up on the outside of the arms.



136. More work for the loins. Hands on one side—arms apart—and slowly bring up the legs between them; see me





If you have practised the exercises on the Parallel Bars with spirit, you will find these last three on the Pole comparatively easy.

137. We come now to an exercise which requires a little care, but only a little, as you will have acquired a tolerably firm grasp, that is, if you have passed the Bar. Suspend yourself by both hands, on one side of the pole, and swing gently at first, as you will feel your hands inclined to slip; but you gain a firmer hold by degrees. Increase the height till you can swing freely as I do.



138. If you feel confidence, boys, try, as you swing back, to spring up from the pole and come on the hands again as you are descending. Whoever is leader should stand close by to break the fall, and to prevent coming on the face, should the young gymnast slip. I have however seen many a gymnast spring upwards of a foot from the pole, and always come down again upon it with the utmost certainty; such is the effect of confidence when strength increases



139. This next really requires more tact than real strength, yet, when both are combined, is easily accomplished. First throw your right leg over the pole, as I explained to you in the 133d exercise—then, with a spring, bring up the right elbow so (a)—lastly, by another spring, bring up the left elbow, and by degrees, both arms straight, so as to sit across the pole thus (b).



140. You will now be able, I think, to perform this next little exercise ; it requires quickness as well as strength. I should have told you, that the thumbs are always to be on the same side as the fingers, when not otherwise expressed ; it is of the utmost consequence, for you will really gain power by so doing. Hands on each side, face towards the upright, and with a slight spring, change the position of the hands—



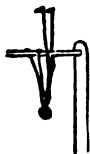
141. Here's a test of the strength of your arm. Put yourself up as in 127 ; hands under the pole—let go the left hand, and see how long you can suspend your body by the right arm, so—now try it with the left.



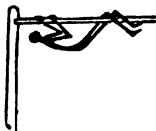
142. Rise as high as you can, so as to see your friends clearly on the other side of the pole—throw your arms over the pole, and hold firmly by them as you would in looking over an orchard wall, like this.



143. Try to erect a perpendicular according to Paul Preston's Geometry. Hands on each side of the pole—draw



144. Now, boys, try your powers at this. Hands on each side, face towards the post—draw yourselves up a little, feet close, and with a swing throw both legs at once over one side of the pole, then over the other. Do this several times.



145. You may perhaps be strong enough now to hang with hands over the pole, and to curl yourself up like this, and go slowly over the pole ; but do not strain too much. As I said before, the strength will come by and by.





146. Get up on the pole, as I did in No. 139, and sit across with hands on each side, and your face towards the post. Now swing yourself completely round, so as to come up to the sitting posture—hold tight—do it several times.



147. Now, again hands on each side, and swing the left leg over the right side of the pole—at the same time let go with the right hand, and catch the pole so that the legs may be between the hands, and bring your face to the front thus—now swing the right leg well, so as to give you an impetus, and go completely round again and again. Remember both hands to be on the same side.





to these exercises ; to the experienced gymnast there is no danger, I have often performed it myself, and seen it done by others, without the slightest evil effect arising from it. It only proves how pliable and at the same time how strong the muscular system may become by systematic training. You will observe that I bring my legs between my arms, beginning in every respect as in No. 136. Let them pass completely through, and hang down thus—twisted so. I then draw myself gradually back between the arms, and hang perpendicular as before.



149. Hang on one end of the pole, hands on each side, face towards the post—swing backwards and catch the pole with the toes—let your back fall in—and suspend yourself thus.





150. Now throw the right leg over the pole—then with a spring bring up the right elbow in this position—at the same time throw the left arm over the pole, and hang thus for a short time.



151. Now, boys, draw up your body as high as possible, hands over the pole, and with a spring elevate, if you can, both elbows at once—if not, one at a time—and rise up gradually till the body is quite straight—now change the position of your hands, so that the fingers may be on the same side as the body, and underneath the pole—then bend forward, and turn yourself gradually over till your feet touch the ground.—Well done!





152. Bramah's patent Detector. Do just as before, except changing the position of the hands, which must remain as they were—sink gradually down, and bestow a 'kiss on that fair Pole'—then rise (there is no occasion to say slowly) to the first position. If this does not discover the riches of your chest, I know not what will.



153. The neatest way of mounting the pole is to throw either the right or left leg across, as we did in No. 133, and with a swing or two bring yourself up, and when on it, sit astride, and with a firm grasp, thumbs across, raise your body off the pole, till it is horizontal, or as near that mathematical line as possible.



154. The Rousting Jack. Hang at one end of the pole—hands over on oneside—let go your right hand—the body



will swing from right to left—clasp the pole on the other side with the right hand—let go the left hand—let the body swing round, and bring the left hand on the same side as the right—so on to the end of the pole—hanging first on one side of the pole, then on the other. Here you will require a firm grasp, as the very act of turning tends to disengage you from the pole; but your wrist must be the pivot on which you principally rotate—the hand must keep you suspended.

155. Now try and throw your right leg over the pole thus—and immediately throw both arms over the pole, holding by them only, like this.

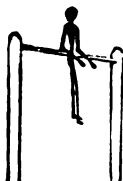


156. If you can do the last exercise, which I dare say you can by this time, throw the right leg over from the left side, the right arm being underneath, and let the left arm down so.





157. Here's muscle, hard as iron! as major Longbow says. Hang on the pole—hands on one side—spring at once on to the pole, and balance yourself on the arms, like this. This certainly is rather difficult at first, but it is astonishing what practice will enable you to do. You see I feel quite at my ease, and do not stir from my position.



158. Looking towards the antipodes. Merely hang on the pole as before, bring your legs between your arms—gradually draw them and your body up, till both are quite perpendicular on the same side as the hands, as I am now.





159. Again mount the pole, and bring both legs over, as as to sit on it, as I do, see—gradually lower the body, till you look something like a grasshopper, and swing with arms behind—bring yourself gradually up again. Once is enough. How do you like it ?



160. Now, young gymnasts, just hook yourselves up by the right hand on the pole—grasp the wrist with the left hand, and endeavor to pull yourselves up. Try to perform the same, by hanging on the left hand. Remember to grasp the pole firmly, as not only is the weight of your body suspended by the arm, but it becomes the purchase, or fulcrum, by which you lift your body up.

161. Sit on the pole, and slide gradually down till you are in the same position as you saw me in No. 159. Now catch the pole with bent arms, like this,—seize hold of the trousers by the pockets, grasp them tight, and swing backwards completely round.



162. Draw yourself up, as I told you in No. 151—grasp the pole firmly, and then kneel on it—hands on one side—steady—don't be afraid—now swing yourself over the pole, and come down on your feet. This is perhaps the most difficult of all, to kneel on a round substance, and that too so small, is a feat to which habit alone can inure you. But by this time you will have acquired such a mastery over your limbs, and so much self-possession, that while others perhaps may tremble, you alone will be the least concerned about the matter. All you have to do is to hold tight by the hands, the rest will easily follow after a few trials.





163. Seat yourself quite comfortably on the pole, as I particularly requested, in No. 159. Vacate your seat by suddenly dropping off it, and hanging, not by the neck, but by the hams, as you may see me.



164. Once more hang with the hands on each side at one end of the pole—then elevate the legs, one on each side, so, try to walk in that position to the other end.



MY YOUNG FRIENDS,

For such I am confident you will permit me to call you, I have often been asked by the public what was there in



In the first place, the muscular system becomes so powerfully strengthened and developed, that there is hardly any species of fatigue, within the power of human endurance, which the well-taught and well-practised gymnast cannot undergo. The animal spirits become so exhilarated and so buoyant, that they are not easily depressed by the common occurrences of life. The health of course is considerably increased, and all the digestive processes go on well.

So much for one's self. But a nobler employment of the new powers has been created ; the presence of mind which is engendered by these, and other equally interesting exercises, to which I shall call your attention, is of the highest importance, when called upon to render assistance to others in the hour of danger. The power of grasping, almost equal to a blacksmith's vice, will enable you to sustain not only your own weight, but a body equal in weight to yourselves along with it.

Should that terrific element, a fire, overtake you in the dead of night, and no way of escape be left you but by a window, it may be, three or four stories high—the fire has approached your room, you can no longer stay, or you will be suffocated by the smoke—no ladder has yet arrived by which you can descend—your only alternative between life and death, is to jump from the window, or hang from the window-sill, to bal

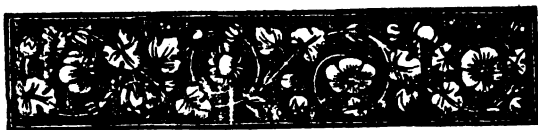


cony if there be one. The former is fraught with danger of breaking your limbs, and becoming maimed for the rest of your days—or what is too often the case, with lingering death ; the latter will enable you to remain for a long time to hang suspended, till relief comes in some shape or other.

The gymnast, knowing his powers, will prefer the latter ; and should he see a fellow-creature in danger, but yet too timid and frightened to venture on either, he will ascend a ladder, and bring down his burden safe under his powerful hold.

Should shipwreck be his lot, he will cling with unflinching tenacity to the rigging, and almost defy the attacks of waves, appalling even to the stoutest hearts of oak. Should an unfortunate being fall into the water, the gymnast, if he can swim—and every boy and girl ought to learn to swim—will be able to hold up both himself and his helpless charge, till some friendly rope or boat come to his assistance. Is he inclined to take a pedestrian tour amidst mountain scenery, whether he be a botanist, mineralogist, or geologist, he will find his gymnastic exercises have been the best preparatives, to fit him for undergoing the fatigues of such an excursion.

In short, such a being will be enabled to go on his way rejoicing, because he has health of body and mind, and is enabled by his powers to render a thousand services to his fellow creatures, which the feeble, the timid, and consequently irresolute, will never be able to accomplish.



CHAPTER IV.

HORSE EXERCISES.

O, PAUL PRESTON! we are glad to see you again. What have you for us now? Something new, no doubt. We have been practising the other exercises you were so kind as to show us, and feel our legs and arms so strong, that we fancy we may venture upon something else.

That's right; come along then and see my stud. Like the horse-dealers, but with more faith, I can warrant my nags perfectly safe and quiet, and fit for any timid lady or gentleman to ride; they never shy nor kick—no danger of their jibbing or rearing with you, nor of your throwing them down and breaking their knees; in fact they are sound in body and limb. Here they are, from a Shetland pony up to a tolerably sized gallows. What do you think of them?—But I must explain. You see I have had them made of different sizes, to suit the little as well as the big boys and girls.



What! do young ladies practise gymnastics as well as boys?—Why should they not? I have seen some young ladies practise many of the exercises that you have been performing. Of course not all of them—it would be neither requisite nor proper—but there are ladies now alive, who can bear witness to the great benefits they received in going through a course of the parallel bars and horizontal pole exercises, under the direction of a medical attendant, superintended by Professor Voelker. Nay, I know some young ladies who practised several of the exercises which I am about to show you on the wooden horse, and acquired thereby such agility and confidence that they ventured with perfect success to repeat them on their live pony, and are now reckoned most expert horsewomen.

To ride well has always been accounted a necessary accomplishment for a gentleman, and as it is a good maxim 'that what is worth doing at all is worth doing well,' I will endeavor to give such a notion of mounting, &c. as will enable you to stride a living steed with at least more confidence, and some little more grace, than if you had never attempted any thing of the kind.

You see these horses are made of one solid piece of wood a portion of the trunk of a tree that does not taper is the best, made as you perceive quite smooth, and rounded at the ends.



The middle, on the top, is covered with leather, about the length of an ordinary saddle, but not stuffed ; the pommels are made of wood, curved at the top, screwed down, and covered likewise with leather. The whole is fixed on four stout legs, which go at least two feet into the ground, to keep them quite firm, and prevent them from rocking.

The pommels, as you see, are placed rather nearer one end, called the head, than the other, to imitate the saddle on the real horse. I should have told you to remark, that the hind pommel or cantle, as it is sometimes called, is rather higher than the front.

Having called your attention to the most prominent points in my steeds, I will only remark, that when mounted, you are not to sit bolt upright like a tailor, nor head foremost like a sailor, but easy as if you were in an arm-chair. The Cossacks, in one part of the world, and the Arabs in another, are perfect models of ease and grace when on horseback.

Before you begin the following exercises, observe the body and head are to be kept upright, and the knees and ankles straight, unless otherwise expressed, or when a change is absolutely necessary. In mounting it is customary to get up on the left, or near side as it is called, of the horse ; though for the sake of practice, and bringing the muscles of both legs and arms into full play, you will have to perform many of the exercises on both sides.



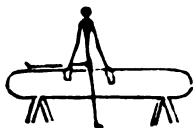
165. To horse! Mark me—place both hands on the middle of the pommels, thumbs inside, so as to grasp them firmly—slightly bend the knees, while the feet are close together, and endeavor to spring up so as to bring the arms quite straight and stiff, as on the parallel bars. Do this several times in succession, without resting on the horse, at first slowly, afterwards more quickly, and always come down on the toes.



166. You must now learn to extend your legs gracefully and with ease. To see a gentleman get on a horse clumsily, argues that he is either an awkward fellow, or has not been properly taught.—Well, spring up as I told you just now, at



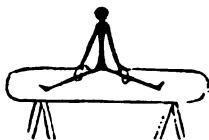
167 Now just try the same experiment with your left leg. To be sure, you will not want to throw your left leg over the horse's head in mounting; but it may so happen, from some cause or other, that you cannot get up on the proper side, then the faculty of using both legs with equal facility will quickly appear. I know a gentleman who has lost his left leg, and has only a cork one attached to his thigh, but who is in the habit of riding a great deal. He is obliged in consequence to mount on the right or off side of the horse, which he does with great ease. This has only been acquired by practice.



168. Let us endeavor to put these last two exercises into practice alternately; for the free motion of your legs is highly necessary to enable you to accomplish the exercises that are to come, with ease and dexterity. Spring up, boys, as before—throw up your right leg—come down to the ground on your toes—up again, and throw up your left leg—again with the right—down—up—now the left—six times each leg



169. If you noticed carefully, you saw that in the last three exercises my foot did not touch the horse, but was brought up perpendicularly—the other leg hung perfectly straight. You must now endeavor, in springing up, at the same time to spread the legs so as to touch the sides of the horse with the toes—no fear of his prancing. Let this be done often, till you can do it easily. Don't forget, that in all these exercises, the arms are to be quite straight and stiff.



170. In order to give a little pliability to your knees, let me see you spring up neatly, as I showed you in the very first exercise—then, as you come to the ground, form a sort of ace of diamonds, by crossing your legs and bending your knees—so.





171. To strengthen the arms still more, and create a variety of action, suppose you spring up as before—arms straight, and resting your thighs against the sides of the horse—now spring away from it, and come back again several times, without touching the ground.—



This is a useful exercise, as it will prepare you for the living horse, that should he start while you are mounting, and before you are well in the saddle, you may have such command over your body and arms, as will prevent you from being thrown to the ground.

172. Having now acquired a facility of raising the leg with ease and grace, and springing up to the saddle, let us try, boys, how you can place yourselves in it. You are not to scramble up as if you were getting over a fence full of



Now throw the right leg over the back pommel, lifting of course the right hand to let the leg pass, and seat yourself in the saddle.

To dismount gracefully requires as much care and attention as to mount ; but, with a little practice is easily accomplished—thus. Place your left hand on the front pommel, thumb inside—put your right hand on the saddle in front of you, and spring off easily, and come on the toes.



173. I told you when I began, that I should sometimes require some of the exercises to be performed on both sides



of the horse, and gave you my reasons—so therefore, without farther preface, be so kind as to go through the 172d exercise, on the off or right side of the horse. Remember, you are now to spring up as before—remain a moment suspended, with arms straight—throw the left leg over the back pommel, and seat yourself as before. In dismounting you are to place the right hand on the pommel, the left on the saddle, and throw the left leg off the saddle, and come down on the toes.

174. Now, my young horsemen, though I don't wish to see one of you exhibit in the amphitheatre, still I should like to see you masters of the Horse; therefore the more agile you are, and capable of vaulting into and over the saddle, the more command you will possess over the animal you ride. Now, by way of a preliminary exercise, again place your hands on the pommels and spring up so as to touch the saddle with the toes, the knees bent, as you perceive. Do this half a dozen times.





175. Again mount ; but in all your mounting be particular as to the manner—do nothing slovenly—remember my former maxim. Now place your hands close together on the front pommel, thumbs outside, and with arms stiff bent a little forward, and raise the body as high as possible from the saddle. Repeat this again and again.



176. The power of sustaining yourself on one hand and arm, if only for a moment, is essentially necessary to be acquired. Suppose, while in the act of mounting the real horse, he should start forward and throw your foot out of the stirup, while your left hand may happen to be on the front



ing down the hand quickly on the pommel—keep the leg perfectly horizontal over the saddle for a time—now throw the leg back again, observing the same precautions. Do this several times without coming to the ground.



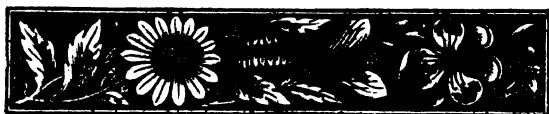
177. Do as I told you in the 175th Exercise, and when you have lifted yourself high enough from the saddle, keep firm hold of the pommel, and swing the body backward and forward. You will find a little difficulty perhaps at first, but you will soon accomplish it. You must not forget to keep the knees perfectly straight.

178. What do you think of this exercise? Nothing like precision; so therefore mount according to rule, and when fairly seated in the saddle place both hands on the

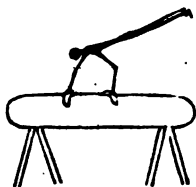


179. Before showing you another exercise, let me remark, that in sitting on the horse, the thighs should press the sides of it so as to leave a small space between the body and the saddle, just sufficient for the open hand to pass between them. I will now only request you to perform No. 176 on the other side of the horse with the left leg.

180. Here is an exercise we used to call the Lady's Leap, and one which I think is easily performed. With hands on pommels, spring up at the same time, turning the right side to the horse, and throw the right leg over in front of the body, lifting up the left hand to let the leg pass, but keeping firm hold of the back pommel with the right hand. Re-



181. You see I have not quite exhausted my stock, but have lots of exercises in store for you, that is, if you are inclined to practise them. Shall I go on? Yes. Well then, again spring up, with hands on pommels; but instead of coming against the side of the horse, throw both legs over the horse behind, taking especial care to come down on your toes, with your face towards the saddle. You see I am quite at home at it.



182. In all these exercises which I have given you, you must understand that they are to be commenced on the near or left side of the horse, unless I show you otherwise, as in this case; for I wish you now to perform the Lady's Leap on the off side, throwing of course the left leg over the saddle instead of the right.

183. Now for a specimen of your agility. Let's see if you can clear the saddle. Hands on pommels as before—spring, and instead of one leg as in the Lady's Leap, throw

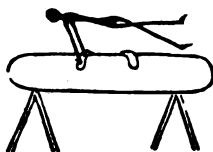


both horizontally over in front—like this, so as to come to the ground on the toes, with face towards the head of the horse.

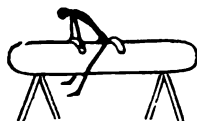


184. The left arm will now be brought into action, to strengthen which, I particularly wish. Therefore, go through No. 181 again, only begin on the off side, and come down on the near side.

185. As you have now become tolerably pliable in all your limbs, I think you will now find but little difficulty in accomplishing an exercise I am about to show you, and which we used to term the Scissors, from the appearance of the legs when crossed. When mounted, swing the body as I directed you in No. 177, and while swinging backward cross the legs, at the same time turning the body so as to sit in the saddle, face towards the tail of the horse. Remark—when in crossing, the right leg goes over the left, you must turn your body to the right side, and when in crossing, the left leg goes over the right, turn the body to the left side.



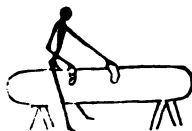
196. Let us vary the exercises a little, and have a sort of eap-frog. Take a run of about half a dozen yards towards the horse from behind, and jump on the end of it—spread out your legs so as to keep them clear of the sides of the horse, as you did in No. 175—and take the trouble to walk to the other end on your hands, and then spring off.



187. Try No. 183 with the left arm, and from the off side—and do not think I give you too many exercises with the left hand and arm ; as I have already said, that to be able to use the left hand and arm as readily as the right is a great acquisition. I have heard more than one medical man wish he could use the lancet with both hands with equal facility



186. This exercise Voelker used to call *Der Mill*; it tried our arms a little. Spring, if you can, on the horse behind the saddle, without placing the hands on the back, by taking a short run from behind—then put the left hand on the front, and right hand on the back pommel. Now raise the body a little, and swing yourself round so as to come on the neck of the horse, and face the front pommel. Now put the right hand on the front, and the left hand on the back pommel, and swing yourself round on the back of the horse, thus making a complete circle.



189. You know when I threw both legs over the horse, in No. 181, I kept my feet close together; now see if, while going over, you can spread your legs open. First spring up as you stand by the side, then try it with a run towards the horse.



draw up your knees close to your chest, and throwing the legs between your arms over the saddle, remaining suspended on your hands, as we did on the horizontal pole; the backs of your thighs leaning against the opposite side of the horse, but without the feet touching the ground. Now draw up your legs again with a spring, and bring them back to the first position.



191. Here's a flying leap—don't be afraid, I shall stand ready to catch you, should your toes catch the saddle, and take care no harm shall befall you, as every good leader ought to do. Therefore run boldly, and jump clean over, as I do. Come to the ground on your toes.





192. Threading the Needle. How do you manage that? Why just spring up, as you know how, resting on the pommels, with the arms straight and throw the right leg between them over the saddle. Bring it back again, and instantly pass the left leg through, resting all the while on the hands. Attempt this several times.



193. Diamond cut Diamond. Mount. Now place your hands on the front pommel—raise yourself slowly, and bring your feet in front of the pommel, outside the arms—rest a moment, then swing—then on to the saddle behind—alternately a dozen times.





194. Who can do this? Step back half a dozen yards from the near side, nearly in a line with the horse's tail, if he has any—run and place the right hand on the back pommel, and throw yourself completely over in front—like this.



195. Here's another tickler—look and see how I manage it. I just spring up, rest on the pommels with arms stiff, and throw both legs between them at once, keeping them straight out, in the form of the letter L, and without touching the saddle too. See if you can do that.



196. You had better try No. 193 on the off side, remembering to place the left hand on the back pommel, and keep the body and legs in such a position as to form a right angle—nothing like attitude!



197. I'll now give you an excellent antidote to the lumbago. When you have placed your hands on the pommels, only spring up and throw the legs on each side of the arms outside, and raise them so as to keep entirely clear of the horse. Don't you feel it ?

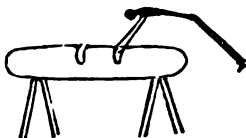


198. Jumping off the horse, when in a kneeling posture on the saddle, has seemed to many a perilous sort of affair, but it is only in the seeming ; for when they have placed their hands on the pommels, and sprung up so as to kneel on the saddle, and brought the knees gradually forward so as to overhang the saddle, and sustain themselves as it were by the instep, they felt as if there were no way of escape, but that of the Scotchman's, through the gap in the hedge 'bock'agen'—but being assured by their leader, who stood close by, that he would catch them instantly if they tripped, without any ceremony they made a spring forward, cleared the saddle, came to the ground quite safe, and then laughed at their own incredulity ; nay, so confident were they of their powers, that



they tried the exercise again and again—and so, boys, may you. So go on.

199. More Leap-Frog! Jump on the back of the horse from behind—place your hands on the back pommel, like this, and swing off backward, just as I do now.



200. Another run, boys, from the near side behind, and throw your right leg over the back of the horse, behind the saddle, without placing your hands on. Do the same from the off side, throwing the left leg over.

201. Once more take a good run, place your right hand on the back of the horse, and with a spring throw both legs over in front, as I showed you in No. 194.





202. Now for a game of Follow-my-Leader. See me, boys, run and jump from behind, clean into the saddle, leap-frog fashion. Now then I swing myself off from the front pommel over the horse's head ; or, if you think you can't manage it so, place your hands on his neck, and clear it in that manner.

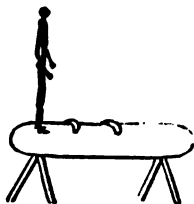


203. I'm giving you two or three hard ones now to try your mettle ; but I know you will not flinch ; so, without more ado, follow me, and spring up, and with arms straight throw your whole body through, over the saddle, and come down to the ground—now try and bring the legs back again to the other side, first slowly, afterwards with a spring.

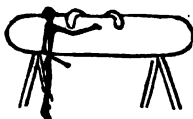




204. Another hard one. Run from behind and jump on the end of the horse, by placing hands on the back of it, and springing up so as to bring the feet on it, and stand upright—open your legs gradually, and slide gently down, body upright, till you sit on the saddle, taking care to press the sides with the thighs on going down.



205. Now take a little run from behind, then placing your right hand on the back of the horse, spring into the saddle. Now try it on the off side with your left hand.



206. Run from behind, touch the back with your hands,



and with the agility of an antelope, 'vault with your armor on,' so as to bring your feet into the saddle—stand up—then slide gently down into your seat, observing the directions in No. 204.

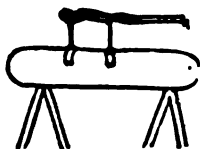
207. Here are two more, as a sort of finale to my horsemanship—something to astonish the natives—that is, if you will do it—I have, many a time and oft. Run, and place your hands on the pommels, take a somerset over the saddle—it is really quite pleasant.



208. *Balancez*, as the dancing master says ; but I very much question whether any dancing master, in town or coun-



the head a little forward and downward, stretching out the body horizontally, as you see—continue in this position as long as you can.



It now remains for you, boys, to practise these exercises with spirit, but at the same time with care. Whoever are the leaders in the various exercises should always be on the alert; 'prevention is better than cure.' Carelessness is the source of many evils; and those very persons, who have suffered from their own want of ordinary care are always the first to decry that by which they have deservedly suffered. The obstinacy of many young persons who came to the Pentonville Gymnasium was truly surprising. Though warned of the folly of attempting exercises they were totally unfitted for from not having gone through a proper training, they yet persisted in doing so, and generally perished.



CHAPTER V.

LEAPING.

Good morning to you all. I see every one seems ready for action ; to use the words of our much loved Shakespeare, these exercises ' do lend a noble lustre to your eye,' and while thus you ' deff your caps and bid good morrow to the sun,' be sure that health will attend your steps, and strew with roses not only your paths, but your cheeks also. Most people prefer looking at a butcher's or a baker's bill in preference to a doctor's ; let alone ' the beggarly account of empty boxes,' that make up anything but a goodly show ; and yet there are thousands ' at this hour asleep,' whom it would be charity to turn out of their nests, and whip round the Park or Common, by way of waking them up into life.

Oh ! here's something for us. Two posts with little holes all the way up to the top, and a rope upon two pegs. Ha ! ha ! that's for us to jump over. Here goes.



Stop ! stop ! order if you please, gents, in Paul Preston's Gymnasium. 'Merry and wise' is an old proverb—but not the less true for all that. Hear what I have to say first, then go to work as fast as you like.

These two posts, you see, are not fixed in the ground, but only placed in wooden sockets, in order that they may be taken up when not wanted, and wooden blocks put in their stead. The holes are for the pegs used to raise the rope, and should not be more than three inches apart ; and these bags are filled with sand, to keep the rope stretched out in a straight line.

You see I have had some of the earth taken up, where I guess you will, or ought to come down on your feet, and some clay put down instead, so that by watering it now and then, it may be kept a little moist, in order that you may not feel that jarring of the body which would naturally ensue by



jumping so often in succession on a hard spot, rendered still harder by continued jumping, equal to the use of a pavior's rammer.

Now then, follow Paul Preston over the lowest line, and don't despise it because it is low.

*'Begin with gentle toils, and as your nerves
Grow firm, to harder, by just steps, aspire.'*

I shall soon get you into a line as difficult as any you ever found in the classics, whether in parsing or scanning. I must not have a single foot out of place ; no skipping over it, but all according to rule.

209. Now stand within a foot of the line, and with elbows near the sides, just bend the knees slightly, having both feet close together, and spring over as I do, and come down on the toes. If you noticed properly, you saw that I did not throw my arms straight forward, but rather upward, when I came over, so that I might better preserve my balance, or equilibrium, as it is called. To come down on the heels is a bad practice ; because, independently of the jar it gives the whole body, it throws the body backward. Suppose, boys, you had to jump over a brook, tolerably deep, as some brooks



backward into the water, have a comfortable float back again and perhaps come with your head against the nettles, just to remind you of your folly.

210. We will now have a hop over this same line. Stand about half-a-dozen paces from the line, now hop on your right leg over it. Don't put down the left foot immediately you have cleared the line, but hop a few yards forward before so doing.

211. Now endeavour to accomplish the same with the left leg. While hopping, keep the elbows near, not close to the sides, and the mouth gently closed.

212. I shall now move the line one hole higher, and proceed in the same manner, till you have reached a height equal to your present powers. I shall on no account let you attempt a single hole higher than I perceive you can accomplish without violent exertion, all which tends to weaken rather than to strengthen.

By practising exercises of hopping alternately with jumping, you will strengthen the muscles of the foot and leg, which will fit you for attempting to leap with the pole, to which I shall introduce you in due time. Those who practise these exercises well, will excel all their companions in 'Fly the Garter,' and 'Hop, Step, and Jump.' And in your



rambles through the fields, it must not only be a very wide ditch or brook, but a sloping fence, bristling very fiercely with tenter hooks, and looking vastly like a line of bayonets ready to receive a charge of cavalry, that will bring you to a standstill. He that jumps well, will often escape sudden danger ; because, knowing his own powers, which are always at hand, he the more readily avails himself of them.

Some have recommended the practice of jumping down flights of steps, a thing Paul Preston cannot approve. There are other and better ways of learning to jump downward and forward at the same time, whether in gravel or chalk pits, sand banks and walls, or from a bank over a brook ; in fact, many places will be found where the gymnast may test his powers in this respect. He will already have acquired some accuracy of eye to enable him to scan in an instant the distance to be cleared, and the requisite force to be used in effecting his object. So, boys, I shall say no more on that point, but will presently learn you how to handle the leaping pole properly, and then you will learn how to leap with it.

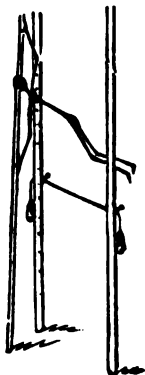
I shall however first give you a lesson in leaping to a distance ; so come along to the farther end of the ground, and look at my triangular ditch. You will perceive it is not more than two feet deep, just sufficient to give the idea of a ditch, and made in the form you see, in order to increase the



distance by degrees. Now begin at this corner, and jump over, one after the other, following immediately after me. Well, I perceive that is as far as you can jump at present, so we will adjourn to the leaping apparatus

LEAPING WITH THE POLE.

So all are armed, quite ready for the fray, and now let me tell you, that I wish particular attention to be paid to my instruction as to holding the pole in leaping. I say this be





cause, in the several excellent books which treat a little about gymnastic exercises, whenever leaping with the pole has been introduced, and attempted to be illustrated by an engraving the artist and engraver, from not having studied or practised gymnastic exercises, have greatly erred in depicting the manner in which it should be performed.

The mode however is very simple, and its propriety will be apparent in the very first attempt. Your left hand and arm, from having been well exercised, will now have become not only equal in strength to the right, but equally capable of the varied motions of which the right is susceptible, consequently there will be as much dependence on the one as on the other.

Extend both your hands towards me with the palms upwards. I now place the pole on them—grasp it—now the nails of both hands are upwards. The top of the pole is about a yard from the right hand, that is, when the leaps about to be taken are neither high nor wide; but as the distance increases, so the space between the right hand and the top must diminish. The consequence of all this is, that the pole becomes a complete pivot, on which the body freely revolves, and the two hands thus encircling the pole act in unison, thereby assisting to move and sustain the weight, namely the body, with the utmost facility.



I have known the adult gymnast, by continued practice, capable of throwing himself over a line nine feet high, which those of you who will take the trouble of measuring and looking at, will find no mean height. Paul Preston has often done it, which, considering he is not a Hercules in stature or strength, may be reckoned tolerably fair. I have told you all this to encourage you to go on ; so now we will begin and take a leap over this ditch, beginning at the narrowest part and increasing as we go on.

Step back a dozen yards, and, as you run towards the ditch, hold the pole nearly horizontally, in the front of you. The moment you approach the place, plunge the end of the pole which is next the left hand into the ground so (1) — not quite





half way across, at the same time springing forward in order to jump to the other side ; while in the act of going over, swing your body round to the right, and remember the greater part of your weight is to be sustained by the right hand and arm (2), the left hand and arm being mainly instrumental in keeping you steady, more especially after your feet touch the ground (3).

This is good exercise—perhaps one of the best exercises that can be practised—for you feel that it brings all your energies into play ; and so far from being improper for girls, it would be the means of strengthening their arms, and more especially their ankles, which now-a-day are so weak from want of use exercise, that to walk a mile or two, is sufficient to lay up many a young lady for a week.

Well, we have arrived at the broadest part of my dry ditch, and as you grow older, and I hope consequently stronger, many a stream, dignified by the name of a river, will be mere



down for a good ducking, and the liberty of swimming ashore as soon as he liked.

Let each now shoulder his pole and follow me to the leaping apparatus. I should have told you to notice that these said poles are made of ash, rather thicker, if at all, at the end which is to be placed in the ground,—nine or ten feet is sufficiently long for you lads ; but for grown-up persons, who can use them, twelve feet will not be too long.

The greatest difficulty with which you will have to contend, in leaping with the pole over the line, is to leave the pole behind you after you have cleared the line, and are descending perpendicularly on your feet. But as I said before, boys, gymnasts can do any thing, if they make up their minds to the trial. My old Mathematical Master used to say, ‘ he really believed boys could find out longitude, if they only set about it.’

You ask me, Why must the pole be left behind ? In the first place it is of no use to you, after you have cleared the line, but rather an incumbrance—for by this time you are quite capable of coming down on your feet, without assistance from anything else—secondly, if it were actually and really a wall or fence you were springing over, without some little care, you would receive an unpleasant jerk, by the pole coming in contact with the top, and perhaps you would be thrown down.



Again, if there were a party of you, and only one pole for the use of the whole, those behind would want to use it also—it is better, therefore, to endeavour to leave it behind, after throwing the body over the height, whatever it may be, and to trust to your agility to alight safely. This by no means precludes the other mode, viz., taking the pole with you—only the line will be knocked down every time.

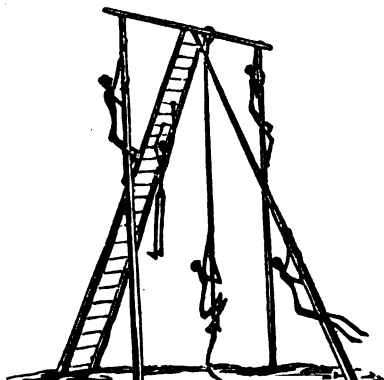
Hold the pole, then, in the same manner as I directed you in leaping the ditch, taking a run of about a dozen yards towards the rope, plant the pole on the ground, not more than a foot from the rope, and immediately spring over it. When you perceive that you have passed the rope, let go the pole, at the same time giving it a slight push from you, for your fellow gymnast, who should be standing ready to receive it. As the height increases, let the knees be kept pliable, and bent a little, in order to break the descent, and prevent its jarring you. This is, perhaps, one of the most healthy and least dangerous of all the gymnastic exercises.



CHAPTER VI.

CLIMBING APPARATUS.

WHAT, more fun ? What tall poles ! a long ladder too and a good thick rope ! Are we to climb up them ?





Oh yes, as fast as you please.

But won't you show us how ?

Most certainly, but examine the apparatus first. Paul Preston has a great notion that boys and girls should be early taught to make a proper use of their eyes : for want of this, ' thousands will travel from Dan to Beersheba, and cry, all is barren,' while others will go over the same road, and find something to admire at every step. Just read the story of Eyes and no Eyes,' in ' Evenings at Home, and you will better understand what I mean.

These two poles are such as are used by builders in erecting houses, and are about twenty feet high ; they are quite firm in the ground, and made still firmer by a cross piece nailed at the top. All the bark is taken carefully off, and the knots are planed down, to prevent any chance of splinters running into your hands.

The ladder is placed at an angle of 45 degrees, and fastened at the top to prevent its slipping. I suppose you know what that means ? If the ladder lay flat upon the ground, it would then be at an angle of 90 degrees. So that 45 degrees means half way between an *upright* position and a *flat* one, between a vertical position and a horizontal one. I have had some of the rundles made square to vary the grasp ; and they are very strong, so that you need not fear trusting your whole weight



upon any one of them. The sides too are quite smooth, and free from projections, that the hands may have a more even hold.

This slanting pole opposite the ladder is to be used for climbing also, while, at the same time, it helps to keep the whole apparatus steady.

Lastly, this rope is two inches in diameter, and fastened with a noose over the cross pole, so that it may be shifted a little if required.

Let us commence our operations by trying to ascend this perpendicular pole; grasp the pole above your head firmly with both hands, try to draw yourself up a little way, and clasp with your legs across—your knees and thighs must assist in sustaining you for a moment, till you have slid your hands, and endeavour to draw up your body a little higher, and so on alternately, holding on by the arms and legs till you reach the top. To descend, encircle the pole with the arms, slacken your hold by the legs, and gently slide down.



you reach the top. In order to descend, grasp the rounds alternately with the right and left hand, being suspended by one arm on each round, till you come to the ground.

When I drew myself up, you saw I did it slowly, not because I wanted strength, but to keep myself steady, to avoid straining the muscles of my arm, and prevent that pendulum kind of motion, which would inevitably be the consequence, if any jerks or violent efforts were used to reach the next step.

You will find that at first this mode of ascending will be fatiguing to you, and perhaps you will not be able to get up above half-a-dozen rounds of the ladder, or climb a very few feet of the pole ; but do not be discouraged — practice makes perfect — and you will accomplish it in time.

Now let me give you a lesson on climbing the rope, which, being loose, affords a greater opportunity of displaying your skill. Reach as high as you can, and grasp the rope firmly, let it be across your left instep, now press upon it with your right foot, pull your body up as high as you can, taking care to keep the rope firmly clasped between your thighs, standing



you come down not to let the rope slide swiftly through your hands, otherwise you will be minus a skin, unless it be as hard as a sailor's, tough as yarn, and tarred into the bargain ; but the thorough gymnast will not be satisfied with this rocking-horse sort of mounting, he will try and learn to climb hand over hand as it is called, with his feet and legs free, depending solely upon the power of his arms, a power he will have gained by this time.

The slanting pole, my lads, you will find a little more difficult, but not dangerous on that account. The difficulty arises from the body being, as it were, suspended between the two moving powers, and the awkward position in which the movements are made ; still it is necessary to try and overcome this. which a little practice will surely do.

Again try to ascend the ladder, by grasping only the sides of it, and sliding the hands alternately up each side till you reach the top, and descend slowly in the same manner. We often used to climb the pole, and, on reaching the top, walk along upon the hands, and descend either by the ladder, the rope, or the slanting pole.

In all your ascents, especially on the ladder, keep the feet and legs as quiet as possible, and close together ; for every time you throw them about, you inevitably throw away as much power.



A rope-ladder, suspended from the cross piece, would be an excellent addition ; it should not be fastened at the bottom ; the gymnast, by his power alone, should learn to keep it steady. Should he be destined for the sea, such a training will give more confidence—especially

“Should sleep, upon the high and giddy mast
Seal up the ship boy's eyes, and rock his brains
In cradle of the rude imperious surge.”

Now, boys, this is all I have to tell you about climbing, your own diligent practice must supply the rest ; and I am persuaded you will have too much spirit to allow trifles to daunt you—only be careful.

PULLING THE ROPE

Well, I declare, here is a tight rope ; if a rope's end a-board ship is like this, the sooner they made an end of roping me, the better, I should say. But, friend Paul, what's it for ? You shall soon see. Place it quite straight on the ground, then take your places in your ranks, under your respective leaders. Before I begin, I must tell you that, simple as this exercise at first sight appears in the Gymnasium, it was one which created more laughter, and brought out more



good humor than any other ; it was not only a friendly contest and trial of strength, but tended materially to increase that strength, whether of the legs, arms, or loins. In conversing with my brother gymnasts on the feats of former days, I have invariably found they recurred to this part of the training, and recounted, with delight, the little manœuvres they used to draw their opponents across the line.

I shall now divide you into two parties, endeavoring to keep each party as nearly balanced in weight and strength as I can. Let each party now march towards the rope. Take your stations opposite each other, and on opposite sides of the rope—the first boy on each side being a yard apart. When I give the signal, stoop down, pick up the rope with your right hand, and hold it till I tell you to put your left foot forward, and seize the rope at the same time with the left hand, hold tight, and plant your feet firmly on the ground, throwing yourselves a little forward, to add weight to your pull.

Now watch me, when I have finished saying—One, two, three, and away !—but not till I have said the last word—
throw yourselves back and pull with all your might and see



dead weight upon them, they can't stir you an inch now
But have a care, or they'll let you all down on your backs,
and then pull you up like a perch out of a pond—after that,
good bye to you. Up in an instant! and pull like artillery
horses at a cannon, or sailors at a capstan, or a steam-tug at
an Indiaman, or—but there they go; I told you so. Hurrah!
nurrah! we've won—what fun! How warm it makes us.



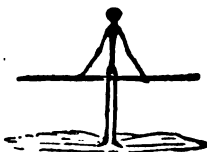


CHAPTER VII.

THROWING THE LANCE OR SPEAR.

WHILE we have the poles in our hands, boys, let me show you two or three exercises, which will assist in developing your muscular powers.

1. Hold the pole before you, like this.

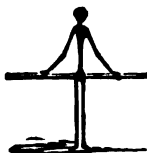


Hands over, grasping it firmly ; bring it up sharply in a horizontal line over the head—so.





Keep it elevated thus, at the full stretch of the arms, but with the feet firm on the ground; and then, without changing the position of the hands, as regards the grasp, bring it down sharply behind, as you see me do.



Return to the first position, by again bringing it up sharply above the head, and finally down to the front.

2. The same exercise may be begun with the pole behind you. In this case, the pole is to lie, as it were, in your hands, in the same manner as I directed you to take the leaping pole in hand.



4. Place one end of the stick on the ground ; put the right hand near the top, the left near the bottom, the feet about four feet from the stick—then bend the body backward, head hanging down—bring the head and body under the left arm, and rise on the other side by pulling yourself up.



A variety of motions may be performed with these poles ; I have given these as a specimen ; your own ingenuity will supply the rest.

We will now make use of these poles as lances or spears, and do that practically which Collins sings poetically :

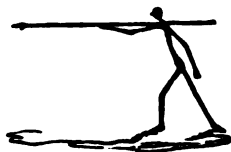
‘ Brown Exercise rejoiced to hear,
And Sport leapt up and seized his beechen spear.’



In throwing the spear, it has been customary with some merely to poise it between the finger and thumb, and then project it to the mark. This may do very well with a light arrow-like weapon ; but even then, the force with which it is thrown will be of little avail, compared with that obtained by grasping it with the whole hand, and hurling it with all the muscular strength of the upper and fore-arm, concentrated as it were into one focus. I shall therefore give you the two principal positions, most necessary to be observed to give the aim its full effect. Grasp the spear in the middle, like this—



with the light end uppermost—let the left arm hang down at ease by the side—look steadily for a moment at the object—





raise the spear so high as the ear, at the same time drawing the arm back, so as to give it all the impetus you can--send it quickly on its errand; but take care not to go after it as I have seen some, in consequence of not standing firmly on the feet.

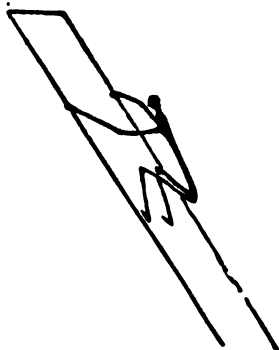




CHAPTER VIII

CLIMBING THE PLANK.

Here's a pretty position for a stout alderman to be placed in—how far up he would get in an hour it would not be difficult to prognosticate; but it would be still easier to guess how





soon he'd come down. Let us hope he will never be placed in such a predicament. It is, however, a capital exercise for you boys—the ability to climb or crawl in any position, will enable you to see many sights, explore mines, caverns, ravines, and a host of other places, into which other people dare not venture from the consciousness of their bodily inability. The plank should be at first laid at a small slope or angle, and gradually elevated till it is nearly perpendicular. It should be two feet wide, and about two inches thick, and firmly fixed at the top and bottom. As the last steps become generally more difficult, if possible, some one should be near the top to assist; and in the first attempts you must not go more than half way. Mind, as you go up, hold tight on each side, and place your feet flat in the middle. As you come down, make small steps, both with feet and hands—and as quickly as possible.

GIANT STRIDE.

Look, boys, here is a practical illustration of the seven-leagued boots, in that most wonderful "History of Tom Thumb." Half-a-dozen at a time may go at a railroad pace, without steaming, in a sort of merry-go-round.



Seize the cross-bars attached to the ropes, hold tight, and start all together, left foot first, leaning the weight of your body on the bars. Take good long strides, and let them rather be directed outwards than otherwise. When at full speed, you know not anything on earth that approaches so much to flying. Now start—increase your speed by degrees—that well. Keep your mouth closed—hold tight—and do not stop suddenly.

CLIMBING THE MAST.

In the Naval and, I believe, in the Military School, there is a kind of mast, with steps, or stout wooden pegs, at intervals, to initiate the scholars in the art of climbing. These steps may, however, be attached to the Giant Stride, as they will enable the gymnast to ascend and unhook the ropes when they are not wanted, as they should not be left in the damp.

The hands and feet in this exercise acquire a facility in placing themselves on projecting points, and the eye is accustomed by it, to measure distance more accurately.



step slanting to the right hand. So keep moving on to the top—when you come down, which must be backwards, let the right foot and hand make the first moves.

2. There is another method of climbing, which certainly expands and strengthens the muscles of the chest, and which I should like you boys to try. Now, look when you begin, place your right foot on the first step, and your left hand on the second—now move your left foot between your right leg and the mast—place it on the next in the spiral direction, with the heel turned backwards, and catch hold of the step above with the right hand. You will now perceive, my whole weight is suspended between my right hand and left foot.

Now I pass my head under my right arm, and keep on performing this movement to the top. But mind, as I descend, when I pass under the right arm, I seize the step with my right hand under it, in order to obtain a firmer grasp.

3. To pass under the left arm, you must cross the left hand over the right and grasp the second step of the second row, with the nails turned upwards. Now pass your left leg between the mast and your right leg, and plant it firmly on the first step of the second row, with the heel outside, as in the last exercise—let go your right hand, and slide your head under your left arm, then place your right hand and foot on the



next two steps, and so on to the top. Don't forget, that whether you ascend or descend, when passing under the left arm, the right hand and foot, or the left hand and foot, should be placed on the same perpendicular row of steps. Do not go up very far at first, but to ensure not letting go, try

4. To ascend the mast by the hands alone, hand over hand, as I showed with the rope.

RUNNING.

This is an exercise, my young Racers, which, if properly conducted and attended to, will be productive of infinite benefit to the whole system. It tends to dilate the lungs and expand the chest, more surely fortifying both against the attacks of many fatal diseases. It will not only make you more healthy and strong, but enable you more readily to rescue others from danger ; and though I would not urge upon you the same reason for excelling in it, that was given by an author some years ago, in the following words : ' How many unhappy soldiers would have escaped a hard captivity, and even a



He that hath no stomach to this fight,
Let him depart

as fast as his legs can carry him.

Now, though Paul Preston, with many others, hopes that war, with all its attendant horrors, both moral and physical may soon be unknown in the world, he has too much patriotism to wish that any of his fellow-countrymen should excel in running away from their enemies. Nay, he would rather see deeply engraven on the hearts and minds of every American the ever memorable words of the Spartan mother, when she presented her son with his shield, 'Return with it or on it,' than counsel any one basely to turn his back upon his country's foes. But there will arise in the course of your lives many instances where the power of running fast and long will be found of great utility. In the case of accidents during travelling, with no house near, the animal disabled by being thrown down, the bones of one individual fractured, or perhaps he has been thrown on his head, causing a concussion of the brain, while his companion, if he has any, has escaped unhurt, and prompt assistance the only chance of saving life who would not then wish to fly on the wings of the wind



tion, and are said to be able to tire out a horse—so long can they keep up continuous running.

It has been truly asserted, that if we see but very few persons run with grace and agility, we see still fewer run fast, and continue it for a long time. This is partly because they do it improperly, and partly from want of practice—they either swing their arms about—bend their knees too much—or lift their legs up so high, that they lose much time, and tire themselves very quickly.

I shall give you two or three plain directions, and then take you a run round the ground for a few minutes, and slowly increase the time and rapidity every day, up to a certain point. Stand in a line, place your hands on hips, fingers in front, arms thrown back, but do not press on your hips. My object in requesting you to do this, is to accustom you to run steadily, but afterwards you may discontinue this, only keep your hands shut, with your arms close to your sides—the right foot forward ready for the start—mouth closed—this



When you commence running, let the left foot make the first step, bringing it down on the toe first, not the whole foot flat at once, but press lightly on the ground; let every movement bear the impress of elasticity. Right face—each captain at the head of his class must keep his eye fixed upon me, that he may be ready to turn sharply or circuitously at the very point that I do. Upon this precision, which must be strictly maintained, depends a great part of the good resulting from this exercise. To be able to stop in an instant, even at full speed, as *Cæsar* says the ancient Britons stopped their horses. is no mean advantage, as it will enable you to avoid sudden and unlooked-for danger, and dart aside with the rapidity of thought. To vary the inclination of your body, I shall turn sometimes to the right, sometimes to the left—one time making a large circle, at another time a small one—and sometimes forming angular figures. Now and then I shall go between the parallel bars, to teach you to run in narrow and confined places. In short, every way and any way that will create variety. So now, my boys, off!





CHAPTER IX.

RECAPITULATION.

THE notion that a boy has of his own body is a very vague one. If you ask him of what it consists, he will tell you of flesh and blood and bone ; and should you tell him that it requires a considerable combination of machinery to move his hand or his foot, he will be very likely to laugh ; therefore he cannot see the necessity there exists for exercise, but still he will take it. He likes running about, driving a hoop, spinning a top, or leaping over a ditch, because he has an instinct within him for exercise, which propels him to take it he knows not why, and but for this instinct he would be weak in body and in mind. If the boy who reads this will pay attention to what we have to impart, we will give him some reasons why exercise is good for him, and what kind it should be, and



Man is made up of the *passive* organs of locomotion, that is the *bones* ; and of what are called the *active* organs of locomotion, which are the muscular and nervous apparatus. The bones are an assemblage of compact organs united together by ligaments, and give the body, whose frame-work they form shape and solidity. They serve therefore to support the body, to render it capable of motion, and partly to protect the more material parts. The back bone illustrates the first of these positions, the arms and legs the second.

Such bones as have motion are held together by strong inelastic substances ; and in some instances, as in the wrist and instep, they bind down the tendons and muscles to increase their strength of action.

The bones being destitute of the power of motion, some machinery has been provided by which they may be moved at pleasure ; these are the muscles, which, by contracting, perform the required motions in the body ; they are composed of bundles of fibres like little red threads. The extremities of the muscles are called tendons, and are the same fibres more closely connected that they may possess less space in a limb, and be inserted into a bone ; all muscles end in tendons. The ends of the bones are covered, when intended to move in each other, with a compact, elastic substance called *gristle*, this having a fine polished surface renders it insensible to friction



or rather prevents it, and by its elasticity defends the joints from injury by their motion on each other.

The largest and most curious bone, or series of bones, in the body is the spine or back-bone, being a chain of joints of very wonderful construction ; it possesses at once the greatest strength and the greatest flexibility, bearing the weight of the whole body, and sometimes six times its weight, and yet allowing of the bending of the trunk in all directions, at the same time that it is a safeguard and covering for the spinal marrow, which, having its root or origin in the brain, is connected with the nerves, and by some wonderful process assists in conveying sensations from all parts of the surface of the body up to the brain. So delicate is this substance that the least wound of it instantly produces paralysis or death ; it also furnishes a fulcrum, stay, or basis for the insertion of the muscles that are spread over the trunk of the body, and likewise a support for the ends of the ribs to rest upon.

The ribs are articulated, that is, joined into the back-bone, but the young reader will remark, that in their natural position, they bend or slope downwards from the place of articulation, and the basis at which they rest at this end being fixed, the consequence of the obliquity is, that when they come to move, whatever pulls them upwards, at the same time draws them out, and, that whilst the ribs are brought to a right angle with the spine behind, the sternum, or part of the chest is



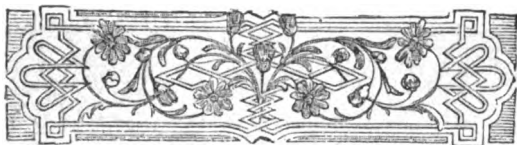
which they are attached in front, is thrust forward. The simple action therefore of the elevating muscles opens the chest ; whereas if the ribs had been joined with the back-bone at right angles, the cavity or hollow of the breast would never have been farther enlarged by a change of the position. If each rib had been a fixed bone, the whole chest had been immoveable, but by this arrangement, at every breath we draw, the chest is considerably increased in size, and this enlargement may be so increased by effort as that the lungs may be distended with seventy or a hundred cubic inches of air.

Connected with the bones, or rather connecting the bones, are the **JOINTS**. Every joint is strictly a mechanical curiosity. In the knee we have what we call the **Hinge-Joint**, and at the hip and shoulder the **Ball-and-Socket Joint**. The former is sufficient at the knee, as only one kind of motion, backwards and forwards, was to be provided for ; the other is necessary at the hip, as not only was the progressive step to be provided for, but also the power of stretching out or widening the legs. Had the hinge joint been used at the hip, the thighs must have been kept constantly together, and the legs loose and straggling. In a common hinge-joint used by artificers, a bolt is observed to pass through the two parts of the hinge, which connects and keeps them in their places. In the hinge-joint at the knee the same thing is done, but by a different expedient : a strong, tough, parchment-like membrane rising from the re



ceiving bones and inserted all around them a little below their heads, encloses the joint on every side; this membrane ties, confines, and holds the ends of the bones together, keeping the corresponding parts of the joint in close connexion. Connected, or rather added, as a supplement to the knee, is a curious little bone, in its form and office unlike any other bone in the body, called the Patella or Knee-Pan. It is circular, the size of a dollar, rather thick, a little convex on the sides, and covered with smooth cartilage. It lies upon the front of the knee, and the powerful tendons by which the leg is brought forward, pass through it; it protects both the tendons and the joint from any injury which either might suffer by the rubbing of one against the other, or by the pressure of unequal surfaces. It also gives the tendons a very considerable mechanical advantage by altering the line of their direction, and by advancing it further out from the centre of motion. These are the uses of this little bone, and the young gymnast will be cautious how he gives himself a blow on the knee, or that he do not kneel on any pointed substance, as, in early years, this little bone is liable to injury, and when badly injured is often attended with very painful and dangerous results.

In the Ball-and-Sock Joint we find a membrane similar to that of the hinge-joint surrounding and inclosing the joint in other important joints, such as the head of the thigh bone,



is an additional security ; a short, strong, string-like ligament is inserted by one end into the head of the ball, by the other into the bottom of the cup, which ligament keeps the two parts of the joint so firmly in their place, that none of the motions which this limb naturally performs, none of the jerks and twists to which it is originally liable, nothing less indeed than the most unnatural violence can pull them asunder. If the young anatomist wishes to be convinced of this by experiment let him try the ball-and-socket joint of a shoulder of mutton, and endeavour to separate them without the aid of a knife.

A comparison of the ball-and-socket joint at the shoulder of the human frame with the joint at the hip, exhibits a difference in their form and proportions well suited to the different offices which the limbs have to execute ; the cup or socket at the shoulder is much shallower and flatter than it is at the hip, and it is also in part formed of cartilage set round the rim of the cup, which contributes more to a free motion and wide range, both of which the arm wants ; whereas in the lower limb, forming a part of the base of the body, having to support the body as well as to move it, firmness was to be consulted as well as action ;—hence the deeper excavation of the socket and a less proportion of cartilage.

In all the joints, the ends of the bones which work against each other are covered with gristle to prevent friction ; in the



ball-and-socket joint the cup is lined, and the ball is capped with it. In some joints, such as the knee, there are loose cartilages or gristle between the bones and within the joints, so that the ends of the bones, instead of working upon each other, work upon the intermediate cartilages, to take off the effect of sudden shocks in running, jumping, and other gymnastic exercises. But another more important provision, manifestly adapted to their use, is the regular supply of a mucilaginous matter called sinovia, more emollient and slippery than oil itself, which is continually softening and lubricating the parts that rub against each other, and thereby diminishing the great friction in machinery of such constant use. For the continual supply of this important liniment there are glands near the joint, and, for feeding the joints with it, excretory ducts hanging like fringes in the cavity of the parts through which the sinovia passes. Thus we see every provision made—first, for the wear and tear by the polish of the cartilages ;—secondly by the healing lubrications of the mucilage ;—thirdly, by the astonishing property of animal constitution which restores all the waste as it occurs. And there is nothing perhaps that should ought to move our gratitude as the reflection, *how well they wear !*—A limb shall swing upon its hinges, or play upon its socket many hundred times in an hour for sixty or seventy years together, with scarcely any diminution of its agility.

We said that muscles were distinct portions of flesh, which



by contracting, perform the motions of the body ; they, with their tendons, are in fact to the human machine what the rigging is to a ship, used both to steady and put in motion the various machinery. The head maintains its erect posture by the assistance of muscles, and a finger is not bent or straightened without the contraction of two muscles taking place. There is an exact relation between the joint and the muscle that moves it ; whatever motion the joint by its mechanical contraction is capable of performing, that motion the annexed muscles by their position are capable of producing. All muscles act by contraction ; their force is exerted in no other way ; when the exertion ceases, it relaxes itself, that is, it returns to its former state. Every muscle is provided with an adversary ; they act like two sawyers in a pit, by an opposite pull, and what is most remarkable is, that they are almost universally so disposed as not to obstruct or to interfere with each other's action. Now, when we reflect upon the number of muscles, little short of five hundred known and named,—how near they lie to each other, in layers as it were, one over another, crossing each other, sometimes embedded in each other, sometimes perforating each other, yet all having their perfect liberty and full play, we are struck with astonishment at the wisdom of the arrangement. Sometimes the action of muscles is wanted where their action is inconvenient. The muscles that move the fingers, to be near the point of action,



should have been placed in the wrist, which would have swelled the part to a clumsy thickness ; but they are wisely disposed at the arm towards the elbow, and act by long tendons, which, like wires, pass from there to the fingers ; in the same manner the muscles that move the toes are placed in the calf of the leg. A contrivance strictly mechanical and beautiful is found in the tendons which proceed from the muscles of the leg and arm to the toes and fingers. The long tendon, as it is called, in the foot, which bends the second joint, being a slit in one tendon to let another pass through it. This course allows to the limb more liberty and a more commodious action than it could otherwise have been capable of exerting.

We have made use of these observations that our young friends may understand that the motions they are called upon to perform in gymnastic exercises, are for the purpose of exercising the muscles, and by their exercise to develop their power and increase their size and strength ; in doing this the body itself is kept in a proper condition, the circulation is promoted, and vigorous bodily health is the result. We shall make a few further observations relative to the positions which are common to the body, and which it may sustain without injury.

Position is that function, passive or active, by which the different parts of the body are maintained in a fixed attitude. The position is *passive* when the body is stretched its length



on the earth ; it is *active* when the trunk is supported by columns, i. e. the limbs.

Biped Position. Man does not form a sole lever from head to foot, he presents a great number of joints which incessantly tend to afford each other mutual assistance. The head fixed on the vertebral column, the top of the back bone, presents a lever of the first order, the main arm of which being directed forward, the head has a tendency to bend in that direction, but the numerous muscles at the back part of the neck maintain their equilibrium.

Spine. The superior limbs, the enormous weight of the organs contained within the chest and the abdomen, finally, the head itself, weigh upon the vertebral column, and would unavoidably draw it forward if it did not, to the solidity of its organization, unite numerous and powerful muscles, extended along its back part, to counterbalance the weight under which it would otherwise sink.

We have had occasion to mention levers of the first, second, and third orders ; to prevent being misunderstood, we subjoin a definition of these powers.

A proper lever is a bar of iron or wood, supported by and moved on a round centre called the fulcrum, having the thing



There are three kinds of levers, according to the situation of the fulcrum. A lever of the first kind has its fulcrum between the weight and the power that is to move the weight, a poker in stirring the fire is a lever of this kind—the bar of the grate is the fulcrum, the coal is the weight to be moved and the hand is the moving power.

The second kind of lever has the weight between the fulcrum at one end, and the power at the other. This kind of lever is found in bellows, doors turning on hinges, nut crackers, &c.

Levers of the third kind have the power between the prop at one end and the weight at the other. The common tongs, shears for shearing sheep, and above all, the limbs of animals, are of this kind. A human arm affords one of the most striking illustrations; here the prop or fulcrum being the socket at the elbow.

SWIMMING.

We ought to treat of this subject as a necessary art. It is not so natural to man as the preceding motions. His physical organization has been calculated upon no hydrostatic law. His specific gravity, however, does not exceed that of water. Thus, in swimming, the whole art consists in multiplying the surface of the body, by extensive motions, so as to displace a greater volume of liquid.



The body, extended on its anterior part, advances on the surface of the water in the following manner : The hands brought together in front of the chest, form a point. The thighs and legs, previously flexed or bent, abruptly extend, striking the water backwards, and impart a slight progressive motion to the body ; at the same time, the superior extremities extend, striking the water in the form of paddles, and the legs are brought together. Next, while progression takes place the limbs flex again, to be returned to their primitive position, when the superior limbs describe a circle, which propel the element under the trunk, and thus it is raised more or less above the water. The spinal muscles are in a continual state of contraction, to fix the back and raise the head. Swimming on the back hardly requires any exertion, with this exception, that the anterior muscles of the trunk are slightly contracted.





GYMNASIUM.

Having shown that gymnastic exercises are requisite for health and the developement of the bodily powers, we may proceed to point out the kind of exercises necessary for this desirable end. For this purpose a piece of ground should be laid out in every school ground, and there should be erected a couple of posts, about twenty feet apart, and sixteen feet high, which should support a plank, about a foot wide, and six inches thick ; on the underside of this might be affixed a hook from which a triangle might be swung, this of itself would be capable of being used in a variety of ways. Two more hooks, about a foot apart, might be used for two ropes, so that the more advanced pupils could climb to the top by means of grasping a rope in each hand, and without the assistance of the feet. A pole may rise from the ground to the cross piece about midway, the pupils will be able to climb up without the assistance of the feet. A wood ladder, and rope ladder, may occasionally be fastened to the beam, but may, when necessary, be taken down. A board about a foot broad may also be set up against the beam inclining four feet from the perpendicular ; the climber will grasp the sides with his hands, and placing his feet almost flat against the board, will proceed to the top ; this is an advanced exercise. Another board may



be set up which should be three feet broad, at least, and should slant more than the other ; the pupil will run up this to the top of the beam easily, and down again ; the middle of this, up to the top, should be perforated with holes, about four inches apart, in which a peg may be placed ; this may be in the first hole to begin with. The pupil will run up and bring this down, and then run up and put it in the second, and so on till he has arrived at the top ; then two or more pegs may be used, and it may be varied in many ways. A pole twenty-five or thirty feet high should be erected, rather thin towards the top ; at distant intervals of this, three or four pegs as resting places should be fastened ; another pole thicker, from about sixteen to twenty feet high, should be erected, on the top of which should be placed four projecting hooks turning on a pivot ; to these hooks four ropes should be attached, reaching to within two feet of the ground. This is called the flying course, from an individual taking hold of the peg at the end of each rope.

One person may cross a rope under the one in possession of another, and by pulling round hard, make the other fly over his head. Care should be taken to make the hooks at the top quite secure, for otherwise many dangerous accidents might ensue. A cross pole might also be set up, but most of the exercises for which this is used, may be performed by the triangle. On the parallel bars several beneficial exercises may be



done, and also on the bridge. This is a pole thick at one end and thin at the other, and supported at three or four feet from the ground by a post at one end and another in the middle, so that the end vibrates with the least touch. This, it will be evident, is an exercise for the organ of equilibrium, and exercises the muscles of the calf, of the neck, and the anterior part of the neck, and those of the back, very gently. On this bridge a sort of sportive combat may be instituted, two boys meeting each other, giving and parrying strokes with the open hands. The string for leaping is also another very pleasing exercise, it is supported by a couple of pegs on two posts fastened in the ground ; the string may be heightened or lowered at pleasure ; it may be raised as high as the leaper's head when a leaping pole is used. Besides these arrangements, a trench about a foot and a half should be dug, and widening gradually from one foot to seven, for the purpose of exercising the long leap either with or without the aid of the pole. Such are the general arrangements of a gymnasium, but before the youth enters upon regular exercises, he may commence with a few preliminary ones.



FIRST COURSE.

EXERCISE 1. Hold out your hand at arm's length till you can hold it out no longer ; repeat this till you have power in the muscles to continue it, without fatigue, for a considerable length of time.

2. Stand on one foot till you are tired—repeat this for a similar period.

3. Hold out both arms parallel with the chin, letting the thumbs and fingers touch each other.

4. Hold the hands behind the back in a similar manner, the arms being stretched as far backward as possible, and hold the hands high.

5. Hold up the right foot by the right hand, extending the leg and arm by degrees.

6. Hold up the left foot in the same manner.

7. Stand with the knees bent, and exercise them towards the ground till you can kneel on both knees at once without supporting yourself as you drop.

8. Raise yourself from this position without the aid of your hands, by contracting back of your legs.



10. Take a piece of wood three inches broad and twenty long, that will not bend, and hold it across the back, the three first fingers touching the wood.

11. Endeavor to sit, but do not touch the ground, nor let any part of your body touch your heels, with your arms stretched out in a line with your chin.

12. Stand with your legs and arms extended, so as to form the letter X.

SECOND COURSE

13. Lay down on your back, and raise your body from a horizontal to a vertical position, without any assistance from the hands and elbows.

14. Draw up the legs close to the back part of the thighs, and rise without other assistance.

15. Extend yourself on your back again, and walk back



18 Lay with your face down, and take hold of your toes while in that position.

19. With your chest downwards, drag your body along by walking only with your hands.

20. Place yourself on your back, and endeavor to advance by means of the propulsion of the feet.

21. Place your body on your hands and feet, with the breast upwards, and endeavor to bring the lips to the ground.

22. Lean on the breast and palms of the hands, and throw the legs over towards the back of the head.

23. Extend yourself on the back, and throwing the hands up above the head, at the utmost stretch, touch the ground, and if possible bring up a piece of money, previously to be placed there.

24. In the same manner endeavour to seize a ball by the toes at full length.

These preliminary exercises having been practised, the young pupil will commence a course of more advanced exercises, such as walking, running, leaping, balancing, vaulting, and climbing. Walking is common to all, but few have a good walk, and nothing exhibits the person to so much disadvantage as a slovenly walk. It is true that the walk of a person will indicate much of his character ; nervous people



walk hurriedly, sometimes quick, sometimes slow, with a tripping and sometimes a running step ; phlegmatic people have a heavy, solid, and loitering step ; the sanguine man walks rapidly, treads somewhat briskly and firmly ; while the melancholic wanders, and seems almost unconscious of touching the ground which he seems to slide over. But the qualities of the mind itself manifest themselves in the gait ; the man of high moral principle and virtuous integrity walks with a very different step to the low sensualist, or the cunning knave ;—therefore the young pupil will be sure that even the Art of Walking, which seems to be an exertion purely physical, will not be acquired properly if his mind has taken a vicious and unprincipled bias ; it will either indicate his pride or his dastardly humility, haughty self-sufficiency or mean truckling to the opinion of others, his honest independence or his cringing servility. But he who has been blessed with the full use of muscular powers, in proportion as he is virtuous, will, with a very little attention, indicate by his bearing, step, and carriage the nobility and modesty of his mind. Bodily exercise by hands or feet, or when even the little gymnasts

Knit hands, and beat the ground,

In a light fantastic round,

as Milton says, all aid in strengthening muscular power.



In walking, the arms should move freely by the side ; they act like the fly-wheel of an engine to equalize the motion of the body, and to balance it. One hand in the breeches pocket, or both, indicates the sot, and has a very bad appearance. The head should be upright, without however any particular call being made upon the muscles of the neck to support it in that position, so that it may move freely in all directions. The body should be upright, the shoulders thrown moderately backward, displaying a graceful fall. When the foot reaches the ground, it should support the body, not on the toe or heel, but on the ball of the foot. This manner of walking should be practised daily, sometimes in a slow, sometimes in a moderate walk, and sometimes in a quick pace, until each is performed with elegance and ease.

In *running*, as the swiftness of the motion steadies the body in its course, without the aid of the motions of the arms, they are naturally drawn up towards the sides, and bent at the elbows form a right angle ; their motion is almost suspended in very swift running. In moderate running a gentle oscillation is observed, increasing in proportion as the body approaches to the walking pace. The knees are now more bent, the same part of the foot does not touch the ground, the body being carried forward more by the toes ; the degree of velocity is acquired in proportion to the length and quickness of the steps ; the person should therefore endeavor to ascertain i



Long or short steps suit his muscular powers best ; generally speaking, a moderately short step, quickly repeated, accelerates motion most. In learning to run, the pupil should first endeavor to improve his breath by degrees ; he must try his speed first in short distances, to be gradually increased ; the distance will vary according to the age and strength of the runner.

The first exercises in running should commence at a gentle trot over a distance of 150 yards, at the rate of about six feet to a second ; this should be varied up to eight feet in a second, for the first three or four days, and the distance increased from 150 to 250 yards. On following days the distance may be increased to 500 yards, and afterwards gradually, until a mile can be performed in ten minutes, which is tolerable good running : afterwards six miles may be tried in an hour, which will be easily accomplished.

As regards rapid running, from 100 feet to 100 yards may be attempted at full speed, and when the constitution is good, the body not too fat, the muscular developments fine, and the lungs sound, a quarter of a mile in a minute may be accomplished, and a mile in five minutes, which is seldom done even in very good running. Ten miles an hour, which is the average speed of the mail, may however be easily performed with judicious and proper training.



LEAPING.

In leaping, that with the run is the most common and the most useful. The object of the run is to impart to the nerves of the body a certain quantity of motion which may carry it onwards after the propelling power has ceased to act when the body leaves the ground ; the run need not exceed twelve or fifteen paces ; in this the steps are small and rapid. When the body leaves the ground, the legs are drawn up, one foot



is impossible. Leaping must, like running, be practised gradually ; in the high leap, a person may easily accomplish the height of his own body, and should practise with a bar, represented in the plate, which may be made of two upright posts bored, through which ropes should be placed according to the height required for the leap ; on these should be hung a string with weights attached to each end to keep it straight. Should the leaper touch it with his feet as he takes his leap, it will be thrown off the pegs, thus showing that he did not make a clean leap.

The deep leap may be acquired from the top of a bank into a hollow, or from the top of a house or wall, in a moment of danger. It may be practised from a flight of steps, ascending a step at a time to increase the height, till the limbs can bear the shocks, to break which the body must be kept in a bent position, so that its gravity has to pass through many angles. The leaper should always take advantage of any rivulet that has one bank higher than the other, to practise himself.

In the long leap, a person ought to be able to clear with a run, three times the length of his body.

The high leap, the deep leap, and the long leap, may be all practised with the pole. For the high leap, the pole should be taken with the right hand, about the height of the head and with the left hand about the height of the hips ; when put to the ground, the leaper should spring with the right foot and



pass by the left of the pole and swing round as he alights, so as to face the place he leaped from. In the deep leap, the pole being placed the depth you have to leap, the body should be lowered forward, and then the feet being cast off, swing round the pole in your descent. The long leap with the pole is performed in the same manner.

VAULTING.

This exercise may be practised on that part of the balancing bar between the posts. It may be performed with or without running ; it should however be commenced with a short run. The height should be, to commence, about the pit of the stomach, which should be increased to your whole height.

CLIMBING.

In climbing the rope, the hands are to be moved one above the other alternately ; the feet should be crossed, and the rope held firm by their pressure ; sometimes the rope may be made to pass along the right thigh just above the knee, and wind round the thigh under the knee.

In climbing the upright pole, the feet, legs, knees, and



THE SLANT BOARD.

This should be seized with both hands, the feet being placed in the middle. The board should be considerably aslant when first attempted, and gradually brought towards the perpendicular.

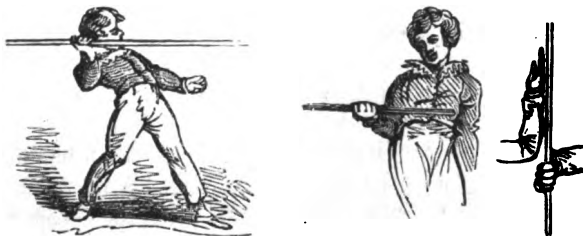
THE ROPE LADDER.

The climber must keep the body stretched out, and upright, so as to prevent the steps which are loose from being bent forward.

The oblique rope must be climbed with the back turned towards the ground, the legs crossed and thrown over so that the rope passes under the calf, and thus he must work himself up by raising his hands one above the other alternately



The Exercises on the ladder are,—1. to ascend and descend rapidly ;—2. to ascend and descend with one hand ;—3. without using the hand ;—4. passing another person on the ladder, or swinging to the back to let another pass.



BALANCING.

THERE are two kinds of balancing to which we shall allude ; the balancing of other bodies, and the balancing of our own.

All feats of balancing depend on the centre of gravity being uniformly preserved in one position. The centre of gravity is that point about which all the other parts exactly balance



each other ; if a body be freely suspended upon this point, it will rest with security, and as long as this point is supported, it will never fall, while in every other position it will endeavor to descend to the lowest place at which it can arrive. If a perpendicular line were drawn from the centre of gravity of a body to the centre of the earth, such a line would be termed the line of direction, along which every supported body endeavors to fall. If this line falls within the base of a body, such a body will be sure to stand.

When the line of direction is thrown beyond its centre, unless the base be enlarged to counterbalance it, the person or body will fall. A person in stooping to look over a deep hole will bend his trunk forward ; the line of direction being altered he must extend his base to compensate for it, which he does by putting his foot a step forward. A porter stoops forward to prevent his burthen from throwing the line of direction out of the base behind, and a girl does the same thing in carrying a pail of water, by stretching out her opposite arm, for the weight of the pail throws the centre of gravity on one



within the base. Rope-dancers effect this by means of a long pole held across the rope, and when you mount the balancing rail, you will find it necessary to hold out both your arms for the same purpose ; nay, even when we slip or stumble with one foot, we in a moment extend the opposite arm, making the same use of it as the dancer does of his pole.

A balancer finds that a body to be balanced is the best for his purpose if it has a loaded head, and a slender and pointed base ; for although the higher the weight is placed above the point of support, the more ready will the line of direction be thrown beyond the base, yet he can more easily restore it by the motion of his hand, narrowly watching with his eyes its deviations. Now the same watchfulness must be displayed by the gymnastic balancer. He first uses the balancing pole, and then mounts the balancing bar without it.

On mounting the bar the body should be held erect, the hands must be extended ; he must then learn to walk firmly and steadily along the bar, to be able to turn round ; then he should practise going backwards.

Two balancers should then endeavor to pass each other on the bar , afterwards to carry each other, and bodies of various weights, in various positions.

Walking on stilts is connected with balancing. A person can walk with greater security upon high than on low stilts.



In some parts of France the peasantry, in looking after their sheep, generally walk on stilts, and it only requires practice to make this as easy as common walking. Some few years ago several of these stilt-walkers were to be seen in London, and they could run, jump, stoop, and walk with ease and security, their legs seeming quite as natural to them as those of the Stork.



3
Gift of The People of the United States

THE BORROWER WILL BE CHARGED AN OVERDUE FEE IF THIS BOOK IS NOT RETURNED TO THE LIBRARY ON OR BEFORE THE LAST DATE STAMPED BELOW. NON-RECEIPT OF OVERDUE NOTICES DOES NOT EXEMPT THE BORROWER FROM OVERDUE FEES.

Harvard College Widener Library
Cambridge, MA 02138 (617) 495-2413

